Contents

Author Contact Details	
Title	**Dr**
First Name	**Andrew**
Last Name	**Boswell**
Job Title (where relevant)	**Independent Environmental Consultant**
Organisation (where relevant)	**Climate Emergency Policy and Planning (CEPP) on behalf of Norwich Green Party (NGP)**
Address	
Post Code	
Telephone Number	
Email Address	

1 BACKGROUND

1 This report has been prepared by CEPP for Norwich Green Party (NGP).

2 Referenced documents and abbreviations:

(A) GNLP, Draft Strategy, Regulation 18 Consultation 29th January to 14th March 2020. The consultation document (CONS)

(B) Sustainability Appraisal and Strategic Environmental Assessment of the Greater Norwich Local Plan, January 2020 (SA)

(C) Habitats Regulations Assessment of Greater Norwich Regulation 18 Draft Plan, December 2019 (HRA)

(D) Greater Norwich Energy Infrastructure Study, May 2019, (EIS)

2 CLIMATE CHANGE

2.1 Climate Change Statement

3 We welcome the Climate Change Statement at CONS page 38 as, for the first time in the GNLP process, issues relating to Climate Change have been brought together in one place. This is helpful.

4 However, the statement serves only as a set of pointers into other policies. It does not provide a Climate Change (CC) policy. As such, it is not effective in providing an overarching policy on CC that can have effective weight at later planning application stages which is required by the legislation.

5 Despite, bullet CONS 140 immediately above the statement stating how the NPPF requires local plans to set strategic policies which address CC mitigation and adaptation, the statement does not fulfil this requirement.

6 However, the statement, with its different limbs, forms that basis of material that could be converted into the skeleton of an overarching GNLP Climate Change policy. Such a policy would be a very positive step for GNDP to take considering the Climate emergency. However, we emphasise the word skeletal, as there would be additional work to take the skeletal structure provided by the statement and turn it into a robust policy, as we outline below. We posit strongly that this is done for the next draft of the plan.

We note that the Director of Place, Norwich City Council, has commented that there is a disconnect between the Climate Change statement and the policy substance needed for the plan to "contribute significantly to delivery of a low carbon future" [1].

[1] *Report to Sustainable Development Panel, Norwich City Council, 15th January 2020, "Greater Norwich Local Plan: regulation 18 draft plan consultation", bullet 27: "**The draft GNLP Strategy document addresses some of the issues raised by the council during its development as noted above. However, a number of outstanding issues remain, including the emphasis on rural dispersal /village clusters and transportation concerns. There is a disconnect between the vision, objectives and climate change statement and the actual policy substance needed to enable the plan to contribute significantly to delivery of a low carbon future."***

7 Overall, we submit that a dedicated CC policy is required. As a recent example of good practice in please see Stroud District Local Plan Review, Draft Plan, in which a new Core Policy on Climate Change mitigation has been included[2].

2.2 Issues with baseline carbon emissions, budgets and targets

8 Previous submissions by CEPP and NGP have made the case for baseline carbon emissions, budgets and targets to be developed for the GNLP in a numerically quantifiable, measurable and reportable form. The draft plan makes no progress compared to the JCS on this, and also includes some confusing elements. These are:

(A) CONS bullet 84 introduces per capita CO2 footprints, whilst SA 2.11 (page 25) introduced the population-wide footprint (from the DBEIS data for UK local authority and regional carbon dioxide emissions national statistics). Whilst both ways of looking at the data (per capita or population-wide) are valid, it would be preferable to use just one. The population-wide footprint is the most appropriate as that relates directly to the overall CO2 budget available (see below).

(B) No historic or future trend information is given. Any meaningful narrative around carbon emissions must be focussed around trends, and national policy is framed in targets (eg net-zero by 2050, or the Paris Agreement temperature target of 1.5degrees). Targets imply a "journey" to reach a target, and understanding trends, both real historic one and projected future ones, is necessary to understand the journey.

(C) The methodology for assessing carbon emissions in the SA is given at SA, Box 2.2 (page 25):

> *"Development proposals which could potentially increase the Plan area's carbon emissions by 1% or more in comparison to the 2017 estimate would be expected to have a major negative impact for this objective. Development proposals which may be likely to increase the Plan area's carbon emissions by 0.1% or more in comparison to the 2017 estimate would be expected to have a minor negative impact for this objective."*

It later becomes apparent in the SA (though it is not clear in the statement above), that the percentage increase in carbon emissions for the above test is calculated by simply calculating the increase in emissions based on new population and the current levels of emissions. This method is naïve and flawed for the following reasons.

It ignores the crucial fact that the underlying carbon emission footprint must significantly decrease to meet national obligations. For example, using the SCATTER budgeting (see below), emissions should be decreasing by over 13% per year. There is a real increase in emissions from population growth,

[2] *Stroud District Local Plan Review, Draft Plan, November 2019, https://www.stroud.gov.uk/info/Draft_Plan_2019.pdf, Core Policy DCP1 "Delivering Carbon Neutral by 2030"*

but this is a second-order effect compared to the real reductions (a much larger quantity) implied by meeting budgets – the first-order effect. Therefore, the SA methodology is based on minor second-order effects rather than the predominant first-order effect, and provides no reliable guidance on assessing carbon emission reductions for the SA.
Further, it suggests that the only way the local plan can affect carbon emissions is by population growth. And that all other effects of carbon emissions will result from external effects (eg: national CC policy instruments).

However, the principle underlying Section 19(1A) of the Planning and Compulsory Purchase Act 2004 is that local plans themselves must include policies designed that "contribute to the mitigation of, and adaptation to, climate change." The SA provides no method to assess these policies, and it should do to be consistent with the Act.

(D) The above SA test and SA methodology effectively set a default target for the GNLP of maintaining carbon emissions as they are. This is clear that development which did not increase the population would register a 0% increase or decrease in emissions. The notion that underlying emissions stay constant is not consistent with national policy.

(E) This approach appears to be reflected in the Monitoring Framework, and objective GNLP16 which is:

"*To minimise carbon dioxide equivalent emissions per capita to contribute to meeting the national target to bring all greenhouse gas emissions to net zero by 2050, taken from the Department for Business, Energy and Industrial Strategy data."*

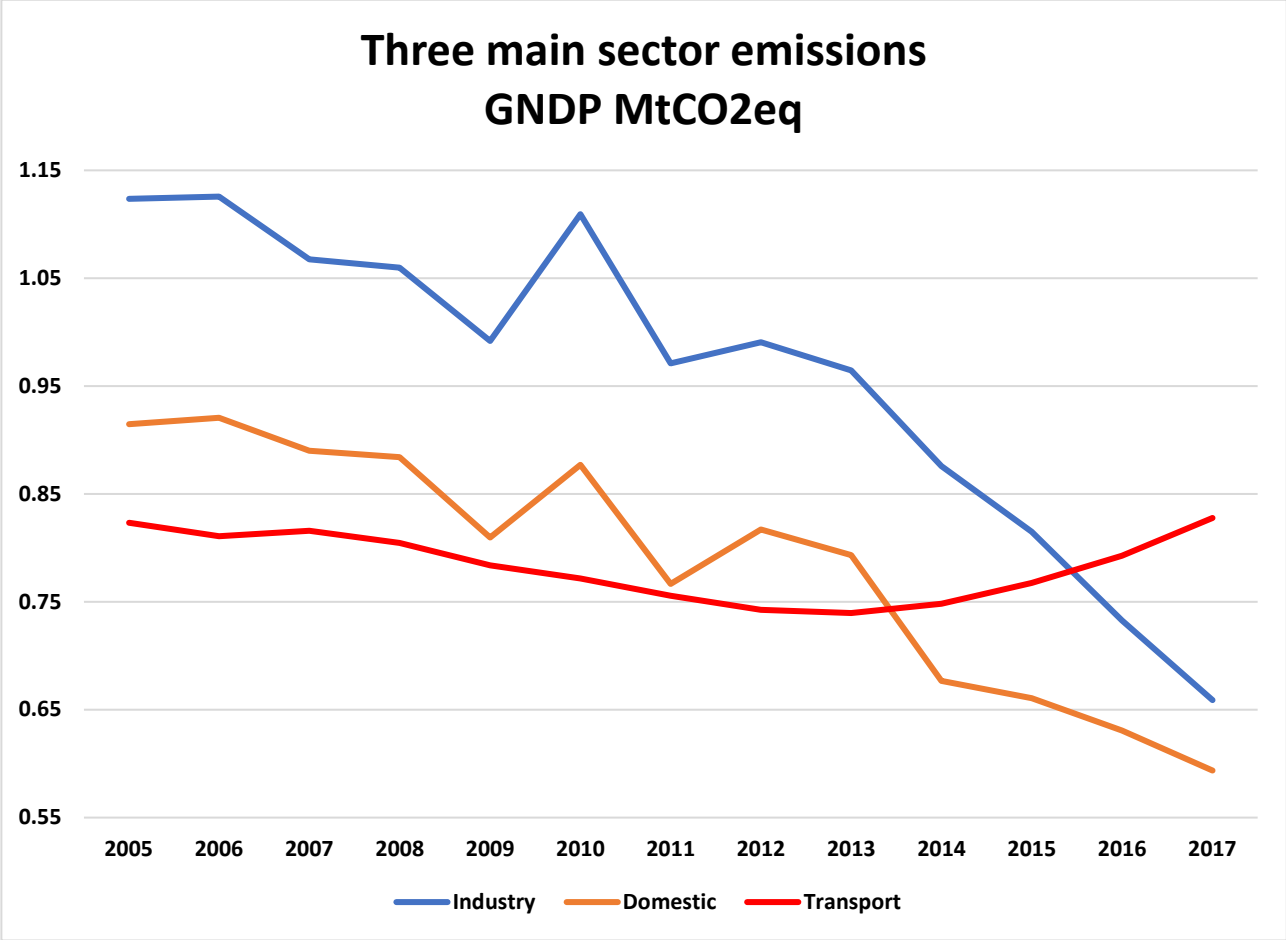
This appears to be the same monitoring as under the JCS where any reduction in emissions (even a fractional percentage) is scored RAG "Green". "Minimise" means no increase. This is a wholly inadequate monitoring regime in two respects:

i. in the climate emergency, significant year-on-year reductions are required
ii. no quantification is given at all

2.3 Trend based baseline carbon emissions, budgets and targets

9 This section is not comprehensive, but it presents material that would be helpful to GNDP in writing next draft plan to address the issues raised in the previous section.

10 The DBEIS data between 2005 and 2017 provides a useful guide to baseline emissions in the area by each main sector, Industrial, Domestic and Transport – crucially it shows trends in emissions reductions and increases. The aggregated emissions from the DBEIS data for Broadland, Norwich and South Norfolk is shown below.



11 Overall there has been a 28% reduction in emissions over this period. The figure above shows that in Greater Norwich area, Industry and Domestic emissions have reduced whilst Transport emissions are rising and are at the same levels as in 2005. In general, national trends in the decarbonisation of electricity has enabled significant reductions for industrial and domestic carbon footprints. A robust climate change policy in the GNLP could have further significant impact locally on bringing down Industry and Domestic emissions.

12 Road transport emissions have made no significant reductions in over 14 years, indicating a major policy failure, both nationally and locally. This may only be remedied by a very tough set of policy interventions in transport for modal shift away from private car use; electric vehicles may only play a small part in decarbonising transport for reasons we give elsewhere. The GNLP Climate Change and Transport policies should have reducing transport emissions as their number one objective.

13 For context on looking to the future, and the plan period to 2038, we give some background on the international climate situation.

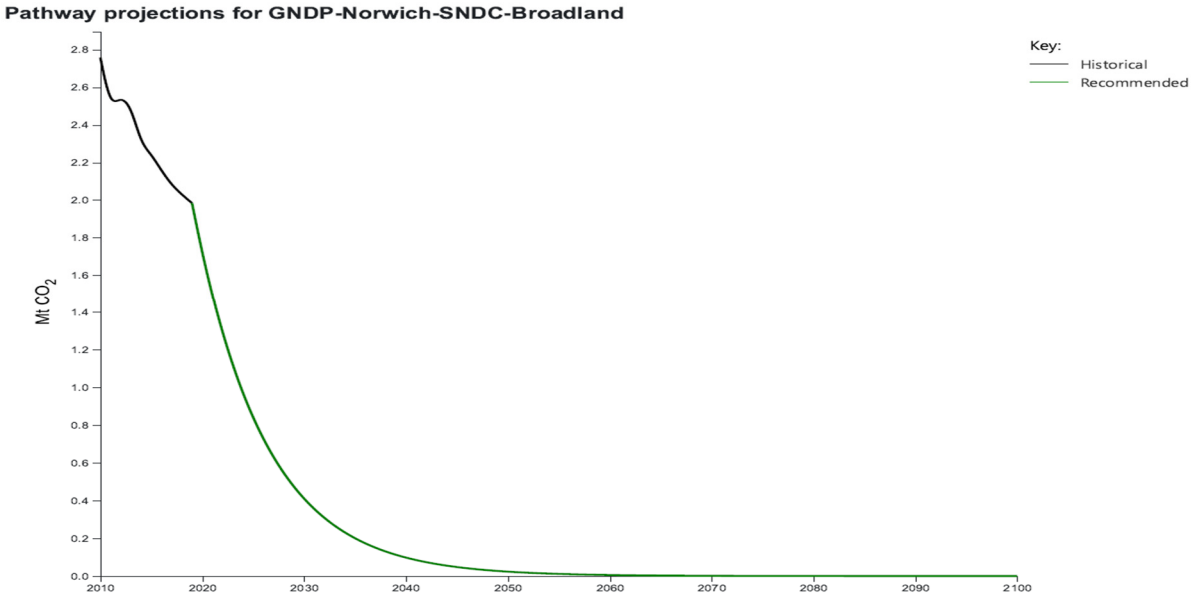
The nations of the world agreed the UN Paris Climate Agreement in 2015 to limit average global temperature rises from human activity to "well below 2°C" and to "pursue efforts towards 1.5°C". For any temperature, scientists can produce a global

carbon budget to meet the temperature target with a certain probability. In 2019, a team of scientists produced carbon budgets for every UK local authority area, known as SCATTER models, based on a UK budget calculated using climate equity principles from the Paris Agreement. The aggregate budget for the GNDP area is given as an Appendix.

14 A summary of the aggregated SCATTER budget is given below:

	Broadland	**South Norfolk**	**Norwich**	**GNDP**
Remaining CO2 budget 2020 – 2100 (MtCO2)	4.5	4.9	3.4	12.9
Budget expires at current (2017) burn-rate	2027	2026	2027	2027
CO2 annual reduction rate from 2020	>13.0%	>14.2%	>12.7%	>13.4%
5% budget left year	2042	2040	2043	2041

15 The step change in emission trajectory needed to meet Paris obligations is shown below, reproduced directly from the SCATTER budget (from the Appendix).



16 The key points to note are:

(A) To meet the UK's Paris Agreement commitments, carbon emissions need to reduce at 13.4% per year across the GNDP population. This must start now and requires a step change in policy and in delivery of emissions reductions.

(B) Continuing at current "burn-rate" will use the budget up around 2026-2027. Such a scenario will take humanity beyond the limits of the Paris Agreement and into very dangerous territory.

(C) These figures represent the best scientific estimate of reductions needed for Paris compliance, and are supported by the local UEA Norwich Tyndall Centre (part of the same Tyndall Centre that produced the SCATTER methodology and data).

(D) This data is different from the Committee on Climate Change (CCC) budgets. There are detailed technical reasons for this which will be published shortly in a paper in "Climate Policy" (https://www.tandfonline.com/loi/tcpo20) by Professor Kevin Anderson and team (personal communication from the SACTTER team).

2.4 Need for baseline carbon emissions, budgets and targets

17 The draft plan contains quite a few statements on Climate Change that sound promising (for example, bullet CONS 82 "*Mitigating the effects of climate change within the Greater Norwich area is a cornerstone of the GNLP*") but which lack substance and any clear demonstration of a route to their deliverability.

18 We have made the case, many times previously (please refer back to previous consultations responses from NGP, CEPP and Dr Andrew Boswell) that the gap between warm words and deliverability can only be achieved by fully understanding baseline carbon emissions, setting a GNLP carbon budget that is aligned to national and international obligations, and with measurable targets for achieving it. None of this exists in the draft plan.

19 Again, we refer to the Stroud Draft plan as an example of good practice. Here the Council declared a target to become carbon neutral by 2030, ahead of the current Government target. This target has been brought into the local plan, joining up political will with strategic planning[3].

20 The situation in Greater Norwich is less clear politically with the County Council stating in its Environmental Policy that it will work towards carbon neutrality by 2030, the City Council having a 2050 target. And Broadland and South Norfolk apparently working towards positions. There is a clear need for a unified target across the area, and for it then to be embedded into the GNLP with the necessary policies to help deliver it through the strategic planning system. No work appears to have been done on this, although the time before the Regulation 19 consultation and subsequent process, gives space for related political decisions to be progressed.

2.5 The Sustainability Appraisal shows Climate Change objectives are not met

21 We have indicated above that the methodology for assessing carbon emissions in the SA is not fit for purpose. However, despite this, the SA indicates in several respects that the Climate Change objectives of the plan are not met, and emission reductions are not being facilitated.

---

[3] *Stroud District Local Plan Review, Draft Plan, November 2019, https://www.stroud.gov.uk/info/Draft_Plan_2019.pdf, Core Policy DCP1 "Delivering Carbon Neutral by 2030", see Page 14 "**This cross-cutting issue is touched upon by many of the Draft Plan's key issues and emerging Strategic Objectives, and responses to it are embedded in the overall Development Strategy, as well as detailed policies and proposed site allocations.**"*

(A) SA, page 72, Table 4.2 gives an impact matrix of all the policies assessed. "Climate Change Mitigation and Adaptation" and "Natural Resources, Water and Contaminated Land" each score the most negative scores as indicated by red squares. "Air Quality and Noise" score the next worse. This impacts significant environmental impacts of the plan objectives, especially for Climate Change. In a Climate Emergency this is not a viable way forward.

(B) SA, page 53, Table 3.2 gives an impact matrix of all the sites assessed. Many sites are scored red for Climate Change.

We note that the Director of Place, Norwich City Council, has commented that the level of growth in rural areas "is very hard to reconcile with the climate change agenda and the need to reduce carbon emissions" [4] which is reflected in the SA assessment.

(C) SA, page 62 (part of Table 3.3) identifies adverse impacts. Under Climate Change "Contribution to greenhouse gas emissions", it states under 3 bullets:

i. That Policy 2 for low carbon energy generation and sustainable building design is not expected to fully mitigate this impact. The statement is meaningless as "this impact" is not defined properly, and what "fully mitigate" would mean is also not defined. The statement lacks any quantification; this is where proper budgeting, footprinting and targeting could turn a meaningless statement into something which is measurable and monitorable.

ii. Policies 2, 3, 4 and 6 will provide a "multifunctional green infrastructure network" that will provide "additional carbon storage" or carbon sinking. This is again fine words, but totally unquantified. There is no clear indication of what is intended to be achieved, and how much carbon will be sunk, and how, and how much, it will contribute to keeping with a Paris aligned carbon budget for the area.

The role of Green infrastructure as a carbon sink needs to be developed with details of specific methods which will produce the best outcomes in emissions reductions.

iii. Policy 4 aims to encourage sustainable transport and a reduction in traffic related carbon emissions. They policy is not expected to meet a 30% reduction in carbon emissions from road transport by 2032, an objective under the 2018 DEFRA Clean Growth Strategy. This is of great concern – we have shown above that transport emissions in the area are at 2005 levels and rising. We look at Transport in Policy 4 in more detail below.

---

[4] *Report to Sustainable Development Panel, Norwich City Council, 15th January 2020, "Greater Norwich Local Plan: regulation 18 draft plan consultation", bullet 23: "**As noted above, 9% of total housing growth over the plan period is planned to be located in village clusters. Despite the fact that the strategy document in policy 7.1 proposes that the primary focus of planned development is the Norwich urban area, it also supports a level of growth in rural areas which is very hard to reconcile with the climate change agenda and the need to reduce carbon emissions, and will have impacts for infrastructure provision. This approach is considered to be inconsistent with the greater emphasis expressed within the document on addressing climate change and significantly reducing carbon emissions, for example in the Vision and Objectives and Climate Change statement, and may undermine the ability of the plan to deliverable sustainable growth."***

iv. We note that the Director of Place, Norwich City Council, has commented that "the lack of ambition on transport issues and the focus on significant development in rural villages is inconsistent with the statements within the plan on addressing climate change" [5].

2.6 Policy 4: Transport

22 Policies 2 and 4 are mentioned at CONS, page 39 (the Climate Change Statement table). The DEFRA Clean Growth Strategy objective to meet a 30% reduction in carbon emissions from road transport by 2032 should be included here as a footnote (before footnote 49). As above, the SA states that this objective will not be met by the plan.

23 CONS, page 61, Policy 2, bullet 6. This is a very weak, bland statement and contains no reference to modal shift and targets for modal shift.

We note that the Director of Place, Norwich City Council, has commented that Policy 4 is "insufficiently ambitious in supporting the transition to a low carbon future by achieving significant modal shift" [6].

We would agree and suggest a modal shift hierarchy needs to be developed and made central to Policy 4, Transport section. Road building, known to increase traffic, lock-in car dependence, congestion and carbon emissions, should be the option of last resort. Currently Policy 4 places various road building projects as options of high priority; these should be removed as below.

24 CONS, page 76, Policy 4, bullet on A47 dualling, and other, projects being promoted by Highways England. Following the February 27th 2020 judgement in the appeal court[7], the Airports National Policy Statement (ANPS) has been prevented from having any legal effect "unless and until the Secretary of State has undertaken a review of it in accordance with the relevant statutory provisions". This is because the Secretary of State failed to consider the Paris Agreement (signed 22 April 2016) in the ANPS. This is a landmark judgement that will have repercussions for any infrastructure projects that increases emissions going forward in the Climate emergency.

We submit that the A47 dualling projects, on Highway's England own analysis increases carbon emissions in construction and use. Highways England has also failed to consider the Paris Agreement as the Paris Agreement is not mentioned in any of the scheme

---

[5] *Report to Sustainable Development Panel, Norwich City Council, 15th January 2020, "Greater Norwich Local Plan: regulation 18 draft plan consultation", bullet 26: "**The strategy document makes a number of positive statements about the importance of tackling climate change, including in section 3 (Vision and Objectives) and section 4 (the Climate Change Statement). However the lack of ambition on transport issues and the focus on significant development in rural villages is inconsistent with the statements within the plan on addressing climate change, for example that the plan is "seizing opportunities to promote low carbon development and address climate change" (para 140 of the strategy document)."***

[6] *Report to Sustainable Development Panel, Norwich City Council, 15th January 2020, "Greater Norwich Local Plan: regulation 18 draft plan consultation", bullet 25: "**Policy 4 (Strategic Infrastructure) is considered to be insufficiently ambitious in supporting the transition to a low carbon future by achieving significant modal shift. Although the policy makes reference to the importance of achieving modal shift, it does not fully recognise the need to integrate transport and land use policies, and there is no mention of mobility hubs as part of a sustainable transport network (as currently being developed through the Transforming Cities programme)."***

[7] *R (FRIENDS OF THE EARTH) v SECRETARY OF STATE FOR TRANSPORT AND OTHERS CA (2020), see: https://www.judiciary.uk/wp-content/uploads/2020/02/Heathrow-summary-of-judgments-26-February-2020-online-version.pdf & https://www.judiciary.uk/wp-content/uploads/2020/02/Heathrow-judgment-on-planning-issues-27-February-2020.pdf*

documents. We expect to see a legal challenge is being mounted against the National Network National Policy Statement (NN NPS) which would cover proposals for developments such as the A47 under the NSIP regime. We await the outcome of legal challenges to the National Network NPS that will provide further clarity on this issue. In the meantime, we do not believe that the plan can rely on including the A47 proposals under "strategic infrastructure", **and the A47 proposals should be removed.**

25 CONS, page 76, Policy 4, bullet on "delivery of the Norwich Western Link road".

(A) The NWL on Norfolk County Council's own analysis increases carbon emissions in construction and use. The issue above (for A47) applies here too. The Paris Agreement has not been considered in the NWL business case. Given the legal uncertainty, we do not believe that the plan can rely on including the NWL proposal under "strategic infrastructure", **and it should be removed.**

(B) We also note that the HRA assessment of Policy 4 at HRA 8.2.2 considers the impact of the NWL on the River Wensum SAC and recommends the additional text underlined 'Delivery of the Norwich Western Link Road provided that it can be achieved without causing an adverse affect on the integrity of the River Wensum SAC.' The wording of Policy 4 does not include this recommendation from the HRA.

(C) Given the recent, and emerging scientific evidence for impacts to the Weston super-colony of rare and protected species of barbastelle bats, we recommend that if the NWL remains in the plan (at (A) above we give reason for its complete removal), then the additional text should be "…provided that it can be achieved without causing an adverse affect on the integrity of the River Wensum SAC, and to the Weston super-colony of rare and protected species of barbastelle bats."

2.7 Policy 2: Energy section

26 EIS, Table 1, page 5. This essentially showed the lights going to go off in most of Norwich with the planned developments and without any intervention. This risk to the existing network is an argument for a much more creative, visionary approach to energy which would facilitate significant carbon reduction too. The GNDP councils should be thinking of smart grids, much greater efficiency in housing (including retrofit insulation programs), greater on-site renewables and energy balancing and storage. The Egnida EIS document does make some good suggestions toward this (see more detailed critique below), for example "semi-islanded development" in chapter 5.

27 However, CONS, Page 61, Policy 2, bullet 10 (Energy policy) does not pick up on this and embed it into policy. The statement needs to be much more pro-active. It also needs to be factored through into the site appraisals which does not appear to have be done.

28 Further on CONS, Page 61, Policy 2, bullet 10 – "*All new development will provide a 20% reduction against Part L of the 2013 Building Regulations (amended 2016)"*. This is a weak target with other areas doing better. For example, Bristol and London (GLA)

have 35% beyond Building Regulations, and Reading "All housing developments over 10 dwellings / 1000m2 to be designed to achieve zero carbon (subject to viability)". The financial arguments against more than 20% at the top of CONS, page 63, need to be revisited.

2.8 More detailed comments on Egnida EIS document

29 The comments in this section have been kindly provided by Dr Nigel Hargreaves of the Norfolk Community Solar, and are reproduced with his permission.

30 The EIS is promising, but we highlight concern to the frequent references to CHP (if biomass or fossil gas fired), gas boilers and diesel generators. No fossil fuel or burning technology should be encouraged in the plan in the Climate Emergency and for Air Quality reasons.

31 The report is "light" on some specifics:

i. Inclusion of energy storage as part of the flexibility solution
ii. No mention of community energy, although despite promoting ESCos. The plan could significantly support community energy schemes via ESCos, as per EIS page 47 "The potential for local authorities to be involved within this type of approach [ESCo] is being explored further in an additional study investigating appetite for local investment and suitability of public, private or hybrid investment model approaches."
iii. No mention of microgrids, although "semi-islanded" developments are mentioned. The plan could provide pro-active policy support to promote development of these.
iv. There could have been more specific recommendations such as solar car ports
v. Grid connection 'capacity bagging' ahead of building should not be tolerated beyond a limited period.
vi. The Electricity tariff of 11p/kWh set in the case study (EIS, page 40) is far too low - making the business case for the proposed scheme appear less viable, despite a healthy looking 8.3% IRR.
vii. The exclusion of community energy shares, or any non-developer commercial interests, in any of the discussion, which could substantially change the costs and look of projects, is a big omission. Denmark, Sweden, Germany and even Scotland are much more switched on to this – why not Greater Norwich?

32 Throw away comments in the CONS document eg: CONS, page 39 (Climate Change statement) "Encourage community-led initiatives such as the promotion of decentralised, renewable and low carbon energy use or securing land for local food sourcing", and CONS, page 101, Policy 7.1 "providing for sustainable energy generation, including a local energy network serving the area as a whole" need much more development within the plan.

3 SIGN OFF

Dr Andrew Boswell, Independent Environmental Consultant
Climate Emergency Policy and Planning
March 2020

4 APPENDIX 1: GNDP SCATTER CARBON BUDGET

33 The aggregated SCATTER budget for the GNDP area is given below as generated on the SCATTER website at: https://carbonbudget.manchester.ac.uk/reports/EE/.

34 SCATTER stand for Setting City Area Targets and Trajectories for Emissions Reduction, https://www.anthesisgroup.com/scatter-greenhouse-gas-tool-offers-a-quicker-easier-solution-for-cities-to-deliver-comprehensive-climate-action/ NB: "City Area" is a misnomer as the method was originally used for Manchester – in fact, it is a generally applicable method to any UK local authority area.

35 The Tyndall Centre at the University of Manchester is based in the School of Mechanical, Aerospace and Civil Engineering, and key areas of research focus include analysing options for mitigating greenhouse gas emissions, including emissions pathways and energy system scenarios work at a range of scales. https://tyndall.ac.uk/partners/university-manchester

The University of Manchester

Tyndall Centre for Climate Change Research

East Midlands | East of England | London | North East | North West | South East | South West | West Midlands | Yorkshire and the Humber | Scotland | Northern Ireland | Wales | Aggregate Budgets

Setting Climate Committments for GNDP-Norwich-SNDC-Broadland

Quantifying the implications of the United Nations Paris Agreement for GNDP-Norwich-SNDC-Broadland

GNDP-Norwich-SNDC-Broadland consists of the following local authorities: Broadland, Norwich, South Norfolk

Date:	September 2019
Prepared By:	Dr Jaise Kuriakose, Dr Chris Jones, Prof Kevin Anderson, Dr John Broderick & Prof Carly McLachlan

NB: All views contained in this report are solely attributable to the authors and do not necessarily reflect those of the researchers within the wider Tyndall Centre.

Key Messages

This report presents climate change targets for GNDP-Norwich-SNDC-Broadland[i] that are derived from the commitments enshrined in the Paris Agreement , informed by the latest science on climate change and defined in terms of science based carbon setting . The report provides GNDP-Norwich-SNDC-Broadland with budgets for carbon dioxide (CO_2) emissions and from the energy system for 2020 to 2100.

The carbon budgets in this report are based on translating the "well below 2°C and pursuing 1.5°C" global temperature target and equity principles in the United Nations Paris Agreement to a national UK carbon budget [ii]. The UK budget is then split between sub-national areas using different allocation regimes . Aviation and shipping emissions remain within the national UK carbon budget and are not scaled down to sub-national budgets. Land Use, Land Use Change and Forestry (LULUCF) and non-CO_2 emissions are considered separately to the energy CO_2 budget in this report.

Based on our analysis, for GNDP-Norwich-SNDC-Broadland to make its 'fair' contribution towards the Paris Climate Change Agreement, the following recommendations should be adopted:

1. Stay within a maximum cumulative carbon dioxide emissions budget of 12.9 million tonnes ($MtCO_2$) for the period of 2020 to 2100. At 2017 CO_2 emission levels[iii], GNDP-Norwich-SNDC-Broadland would use this entire budget within 7 years from 2020.
2. Initiate an immediate programme of CO_2 mitigation to deliver cuts in emissions averaging a minimum of -13.4% per year to deliver a Paris aligned carbon budget. These annual reductions in emissions require national and local action, and could be part of a wider collaboration with other local authorities.
3. Reach zero or near zero carbon no later than 2041. This report provides an indicative CO_2 reduction pathway that stays within the recommended maximum carbon budget of 12.9 $MtCO_2$. At 2041 5% of the budget remains. This represents very low levels of residual CO_2 emissions by this time, or the Authority may opt to forgo these residual emissions and cut emissions to zero at this point. Earlier years for reaching zero CO_2 emissions are also within the recommended budget, provided that interim budgets with lower cumulative CO_2 emissions are also adopted.

Sections 1, 2 and 5 of this report - **Introduction, Methods and References** - can be found in the full print report

3. Results

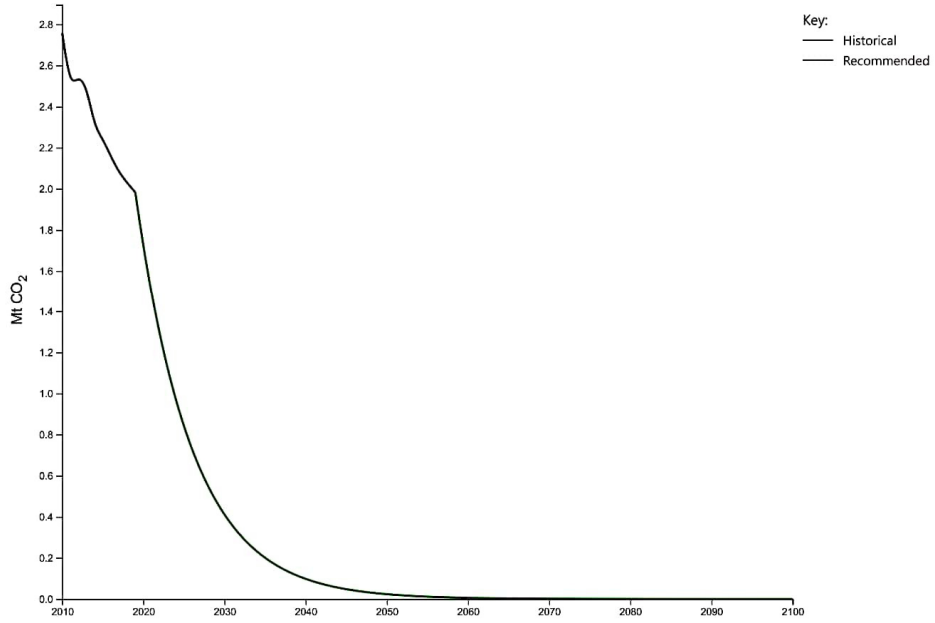
3.1 Energy Only Budgets for GNDP-Norwich-SNDC-Broadland

Following the Method the recommended energy only CO_2 carbon budget for the GNDP-Norwich-SNDC-Broadland area for the period of 2020 to 2100 is 12.9 $MtCO_2$. To translate this into near to long term commitments a CO_2 reduction pathway within the 12.9 $MtCO_2$ is proposed here. A consistent emissions reduction rate of -13.4% out to the end of the century is applied. In 2041 95% of the recommended carbon budget is emitted and low level CO2 emissions continue at a diminishing level to 2100.

Figure 1: *An interactive chart of Energy related CO_2 only emissions pathways (2010-2100) for GNDP-Norwich-SNDC-Broadland premised on the recommended carbon budget.*

Tracking your mouse over this chart will display the actual figures for each of the pathways, as well as for the lead-in historical values.

Pathway projections for GNDP-Norwich-SNDC-Broadland



☐*Show alternative pathway projections (see below)*

Table 1 presents the GNDP-Norwich-SNDC-Broadland energy CO_2 only budget in the format of the 5-year carbon budget periods in the UK Climate Change Act. To align the 2020 to 2100 carbon budget with the budget periods in the Climate Change Act we have included estimated CO_2 emissions for GNDP-Norwich-SNDC-Broadland for 2018 and 2019, based on BEIS provisional national emissions data for 2018 and assuming the same year on year reduction rate applied to 2019. The combined carbon budget for 2018 to 2100 is therefore 16.9 $MtCO_2$.

Table 1: *Periodic Carbon Budgets for 2018 for GNDP-Norwich-SNDC-Broadland.*

Carbon Budget Period	**Recommended Carbon Budget (**Mt CO_2**)**
2018 - 2022	8.5
2023 - 2027	4.3
2028 - 2032	2.1
2033 - 2037	1.0
2038 - 2042	0.5
2043 - 2047	0.2
2048 - 2100	0.2

The recommended budget is the maximum cumulative CO_2 amount we consider consistent with GNDP-Norwich-SNDC-Broadland's fair contribution to the Paris Agreement. A smaller carbon budget, with accelerated reduction rates and an earlier zero carbon year, is compatible with this approach. It is however important that for an alternative zero carbon year the proposed 5 year budget periods are the same or lower that those specified in Figure 2. Furthermore meeting the budget must not rely on carbon offsets.

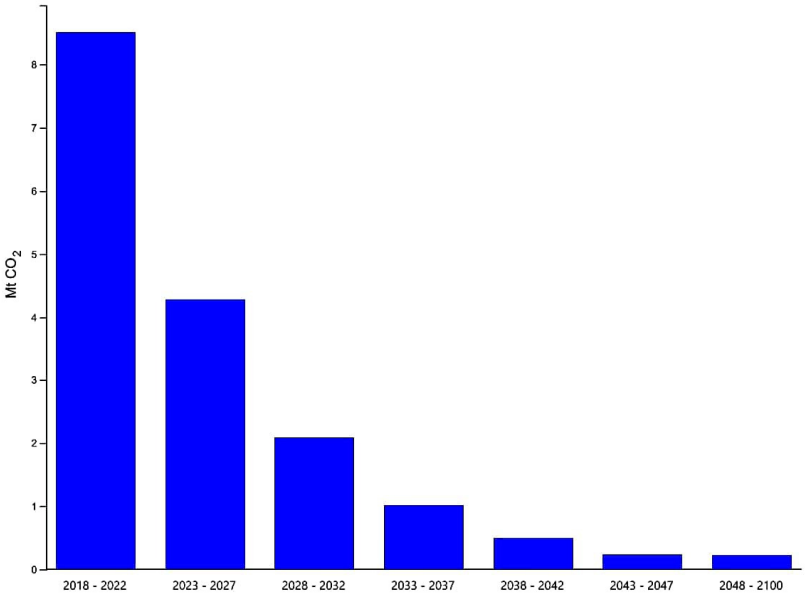


Figure 2: *Cumulative CO_2 emissions for budget period (based on Table 1) from 2018 to 2100 for GNDP-Norwich-SNDC-Broadland*

3.2 Recommended Allocation Regime for Carbon Budget

The recommended carbon budget is based on a grandfathering allocation regime for sub-dividing the UK sub-national energy only carbon budget. There are three distinct allocation regimes that can be applied to determine sub-national budgets. We have opted to recommend one common approach for allocating carbon budgets that can be applied to all Local Authority areas. This enables straightforward compatibility between carbon budgets set at different administrative scales. For example this makes it easier for individual Local Authorities to calculate their own carbon budgets that are compatible with a budget set at Combined Authority scale. It also means that under the recommended carbon budgets, all Authorities are contributing to a common total UK carbon budget. If for example all Authorities selected the allocation regime that offered them largest carbon budget the combined UK budget would not comply with the objectives of the Paris Agreement. The common approach to allocation we recommend therefore further assures that the carbon budget adopted is Paris Agreement compatible.

We have chosen a grandfathering as our common allocation approach because, based on our analysis, it is the most appropriate and widely applicable regime within the UK.

Population and Gross Value Added[iv] (GVA) are alternative allocation regimes. Population shares the carbon budget equally across the UK on a per capita basis. In this allocation regime the UK population is compared to that of GNDP-Norwich-SNDC-Broadland from 2011 to 2016. The carbon budget (2020-2100) for GNDP-Norwich-SNDC-Broadland is then apportioned based on its average proportion of the UK population for the period 2011-2016. For regions where per capita energy demand deviates significantly from the average (e.g. a large energy intensive industry is currently located there) the budget allocated may not be equitable for all regions, therefore it is not recommended as the preferred allocation. GVA is used as an economic metric to apportion carbon budgets. For example, the UK total GVA is compared to that of GNDP-Norwich-SNDC-Broadland from 2011 to 2016. The carbon budget (2020-2100) for GNDP-Norwich-SNDC-Broadland is then apportioned based on GNDP-Norwich-SNDC-Broadland's average proportion of UK GVA for the period 2011-2016. GVA can be useful as a proxy for allocation on economic value, however without an adjustment for the type of economic activity undertaken, areas with high economic 'value' relative to energy use can get a relatively large budget, while the inverse is true for areas with energy intensive industries, and/or lower relative economic productivity. We would therefore not recommend GVA as an appropriate allocation regime for all regions.

Table 2 presents the result outcomes for alterative allocation regimes – population and gross value added (GVA).

Table 2: *Energy only CO_2 budgets and annual mitigation rates for GNDP-Norwich-SNDC-Broadland (2020-2100) by allocation regime*

Allocation regime (% of UK Budget allocated to GNDP-Norwich-SNDC-Broadland	UK Budget[v] ($MtCO_2$)	GNDP-Norwich-SNDC-Broadland Budget ($MtCO_2$)	Average Annual Mitigation Rate (%)
Grandfathering to GNDP-Norwich-SNDC-Broadland from UK (0.6%)	2,239	12.9	-13.4%

Allocation regime (% of UK Budget allocated to GNDP-Norwich-SNDC-Broadland	UK Budget[v] ($MtCO_2$)	GNDP-Norwich-SNDC-Broadland Budget ($MtCO_2$)	Average Annual Mitigation Rate (%)
Population split to GNDP-Norwich-SNDC-Broadland from UK (0.6%)	2,239	13.6	-12.7%
GVA split to GNDP-Norwich-SNDC-Broadland from UK (0.5%)	2,239	11.8	-14.4%

To view the pathways for the Population and GVA allocation regimes, select the checkbox under Fig. 1

3.3 Land Use, Land Use Change and Forestry emissions for GNDP-Norwich-SNDC-Broadland

Land Use, Land Use Change and Forestry (LULUCF) consist of both emissions and removals of CO_2 from land and forests. We recommend that CO_2 emissions and sequestration from LULUCF are monitored separately from the energy-only carbon budgets provided in this report. GNDP-Norwich-SNDC-Broadland should increase sequestration of CO_2 through LULUCF in the future, aligned with Committee on Climate Change's high level ambition of tree planting, forestry yield improvements and forestry management . Where LULUCF is considered, we recommend it compensate for the effects of non-CO_2 greenhouse gas emissions (within the geographical area) that cannot be reduced to zero, such as non-CO_2 emissions from agriculture.

3.4 Non-CO_2 Emissions

The IPCC SR1.5 report identifies the importance of non-CO_2 climate forcers (for instance methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), sulphur dioxide (SO_2) and black carbon) in influencing the rate of climate change. However, a cumulative emission budget approach is not appropriate for all non-CO_2 greenhouse gases, as the physical and chemical properties of each leads to differing atmospheric lifetimes and warming effects . There are also substantial relative uncertainties in the scale, timing and location of their effects.

We do not provide further analysis or a non-CO_2 emissions reduction pathway in this report. However the global carbon budget in the IPCC Special Report on 1.5ºC, that our analysis is based on, assumes a significant reduction in rate of methane and other non-CO_2 emissions over time. Therefore to be consistent with carbon budgets GNDP-Norwich-SNDC-Broadland should continue to take action to reduce these emissions.

The Department of Business Energy and Industrial Strategy's Local Authority emissions statistics do not at this time provide non-CO_2 emissions data at the regional level. Given the absence of robust non-CO_2 emissions data, any non-CO_2 emissions inventory by other organisations at scope 1 and 2 for GNDP-Norwich-SNDC-Broadland may form the basis of monitoring and planning for these emissions. We recommend considering the adoption of a LULUCF pathway that includes CO_2 sequestration sufficient to help compensate for non-CO_2 emissions within GNDP-Norwich-SNDC-Broadland's administrative area.

4. Conclusions

The results in this report show that for GNDP-Norwich-SNDC-Broadland to make its fair contribution to delivering the Paris Agreement's commitment to staying "well below 2°C and pursuing 1.5°C" global temperature rise, then an immediate and rapid programme of decarbonisation is needed. At 2017 CO_2 emission levels[vi], GNDP-Norwich-SNDC-Broadland will exceed the recommended budget available within 7 years from 2020. **To stay within the recommended carbon budget GNDP-Norwich-SNDC-Broadland will, from 2020 onwards, need to achieve average mitigation rates of CO_2 from energy of around -13.4% per year**. This will require that GNDP-Norwich-SNDC-Broadland rapidly transitions away from unabated fossil fuel use. For context the relative change in CO_2 emissions from energy compared to a 2015 Paris Agreement reference year are shown in Table 3.

Table 3: *Percentage reduction of annual emissions for the recommended CO_2-only pathway out to 2050 in relation to 2015*

Year	Reduction in Annual Emissions (based on recommended pathway)
2020	23.4%
2025	62.6%
2030	81.7%
2035	91.1%
2040	95.7%
2045	97.9%
2050	99.0%

The carbon budgets recommended should be reviewed on a five yearly basis to reflect the most up-to-date science, any changes in global agreements on climate mitigation and progress on the successful deployment at scale of negative emissions technologies.

These budgets do not downscale aviation and shipping emissions from the UK national level. However if these emissions continue to increase as currently envisaged by Government, aviation and shipping will take an increasing share of the UK carbon budget, reducing the available budgets for combined and local authorities. **We recommend therefore that**

GNDP-Norwich-SNDC-Broadland seriously consider strategies for significantly limiting emissions growth from aviation and shipping. This could include interactions with the UK Government or other local authority and local enterprise partnership discussions on aviation that reflect the need of the carbon budget to limit aviation and shipping emissions growth.

CO_2 emissions in the carbon budget related to electricity use from the National Grid in GNDP-Norwich-SNDC-Broadland are largely dependent upon national government policy and changes to power generation across the country. **It is recommended however that GNDP-Norwich-SNDC-Broadland promote the deployment of low carbon electricity generation within the region and where possible influence national policy on this issue**.

We also recommend that the LULUCF sector should be managed to ensure CO_2 sequestration where possible. The management of LULUCF could also include action to increase wider social and environmental benefits..

<END OF DOCUMENT>