|  |
| --- |
|  |
| DEFINING CARBON NEUTRALLITY |
|  |
|  |

|  |
| --- |
| Marius Garshol Saunes |

DEFINING CARBON NEUTRALLITY

Table of Contents

[Introduction 2](#_Toc513623707)

[The definition of carbon neutrality 2](#_Toc513623708)

[Is this definition feasible? 3](#_Toc513623709)

[Embodied Carbon: Why it matters 3](#_Toc513623710)

[Issues with scoping embodied carbon for the purpose of carbon accounting 4](#_Toc513623711)

[Carbon Offsetting: Local solutions, but large-scale issues 5](#_Toc513623712)

[The low efficiency of carbon offsetting 6](#_Toc513623713)

[Marketisation of carbon offsetting versus the carbon reducing effects consumers seek 6](#_Toc513623714)

[Issues with large-scale carbon offsetting 7](#_Toc513623715)

[Conclusion 8](#_Toc513623716)

[References 9](#_Toc513623717)

# Introduction

This essay will review what carbon neutrality means from the perspectives of exploring the topics of embodied carbon and carbon offsetting, and how these feature within defining carbon neutrality. The essay begins with presenting the preferred definition of carbon neutrality and justifying why this definition has been chosen as suitable for exploring the topics the essay in large will focus on. The analysis part of this essay will select two vital parts from the definition and critically engage with these. The first part of the analysis will explore embodied carbon and why this topic is important for sufficiently being able to define carbon neutrality. We continue then to discuss the issues with scoping the embodied carbon going into determining carbon neutrality. The second part of the analysis explores carbon offsetting, and how the practice of offsetting seems viable locally, but however there are issues with implementing carbon offsetting on a larger scale. We discuss this issue by demonstrating the low efficiency of some carbon offsetting schemes. Then we explore the issue of carbon marketisation and how large-scale implementation relies on the effectiveness of carbon reduction from offsetting practices. Finally, we discuss the issues with large-scale carbon offsetting, and how more focus on creating a system negating these issues are needed in order to properly implement carbon offsetting on a larger scale.

# The definition of carbon neutrality

The now dissolved Department of Energy and Climate Change (DECC) (2009, p. 4) stated ‘[carbon] neutral means that – through a transparent process of calculating emissions, reducing those emissions and offsetting residual emissions – net emissions equal zero’. The general purpose of most definitions on carbon neutrality is to indicate the best way of achieving carbon neutrality, which is what this definition amply does (Rauland & Newman, 2015). The definition fits PAS 2060, which is the carbon neutrality standard endorsed by the UK government (ibid). The definition also came close to the Climate Change Act 2008, also see the Climate Change (Scotland) Act 2009, which enshrined carbon reduction in UK law. The benefits of reviewing a definition of carbon neutrality against the law aimed at achieving carbon reduction are ensuring the definition holds an expected standard. The previous secretary for the issue of climate change stated total carbon neutrality were to be implemented into law, adhering to the Paris agreement, showing how legislation can be used to further entrench certain climate change goals into a national framework (Vaughn, 2016). Hence, this essay argues using this specific DECC definition of carbon neutrality as it allows us to look into some issues with defining carbon neutrality that ought to be discussed. We are neither arguing that this is the only adequate definition of carbon neutrality, nor that it is the only one with the possibility to adhere to the targets set out in legislation. Rather we are using the content of the definition and the fact that it complies with legislation as justification for why we focus on this definition when discussing the specific topics given priority in this essay.

## Is this definition feasible?

As the Brexit negotiations are currently ongoing it is difficult to predict where the UK will end up in terms of complying with EU law, regulations or directives. However, we predict the UK will follow the international agreements made on climate change, thus making the already existing CCA 2008 as well as the UK government established definition on carbon neutrality we are referring to in this essay relevant for the future. However, as we already mentioned, we would like to add some comments to parts of the definition that approaches certain aspects we feel need to be scrutinised.

# Embodied Carbon: Why it matters

The first topic we address is the issue regarding measuring emissions referred to as the ‘[…] process of calculating emissions […]’ (DECC, 2009, p 4) within the definition. We will be discussing the issue of the inclusion or non-inclusion of embodied carbon in ‘[…] a transparent process […]’ (DECC, 2009, p 4) for measuring carbon neutrality. This issue is important as there is currently no implementation of embodied carbon, the indirect carbon from e.g. transport, when measuring total carbon in products, buildings, etc. (Roibás, Loiseau & Hospido, 2017). It is however understandable from a political outlook, or even an optimistic outlook there is a wish to ignore the embodied carbon coming from everything we are trying to bring to carbon neutrality. The recent years our global economy has increased measurably more than greenhouse gas (GHG) emissions have, the economy is steadily growing whilst the GHG emissions remain at a steady level (Pearce, 2016). Pearce (2016) asks whether we are seeing a decoupling of GHG emissions from the economic growth. The disproportional increase to GHG emissions do stem from more renewable energy, however, the economy is still heavily dependent on fossil fuels (Hayes & Powell, 2017). Thus, ignoring the indirect carbon involved in manufacturing, production, and transportation is incompatible with any actual definition of carbon neutrality (Pearce, 2016; Rauland & Newman, 2015). However, how do we scope it, and where do we allocate it? We ought to argue for a national carbon accounting strategy and rather cooperate on an international scale to ensure we avoid counting emissions several times.

## Issues with scoping embodied carbon for the purpose of carbon accounting

Although, there are still many factors to consider for embodied carbon making even local accounting difficult. Gan, et al. (2017) found that using recycled materials for constructing buildings had the potential of reducing the embodied carbon within the structure by up to 60%, and removing traditional materials, such as cement, and replacing these with alternatives had the potential of reducing the embodied carbon of a structure by one third. However, the difference between transportation of new, virgin materials to use in a building had almost no effect on the embodied carbon, whilst transportation of recycled materials could potentially raise the amount of embodied carbon by one fifth. This demonstrates the difficulty with measuring carbon neutrality, as the carbon emitted transitions from actor to actor depending on the carbon reducing measures that are applied to any construction project. Thus, even if the total amount of embodied carbon is lowered it is difficult to allocate the carbon emitted to a certain source. There are difficulties with altering such practices as each actor might have individual strategies for work methods, limiting the scope construction management has in affecting carbon neutrality beyond only operating emissions.

The importance of tallying embodied carbon when measuring carbon neutrality is as significant as with the carbon offsetting. Carbon offsetting is criticised as it offers us a quick fix, something we can do then and there, and then we are at risk of ignoring the larger issues we need to handle to achieve something more realistic in terms of actual carbon neutrality. It is much the same for embodied carbon, as so much of the carbon going into the production and transportation involved is ignored. Embodied carbon is significant to consider, and thus ought to be included when accounting carbon footprints (Peters, 2010). However, there is a risk of counting the GHG emissions more than once if you try to involve embodied carbon, hence accounting for carbon embodied ought to be limited in scope, preferably locally (Roibás, Loiseau & Hospido, 2017). However, with such a scope on embodied carbon, how is it possible to ensure offsetting is done properly? If transportation is out of country X but does most of the driving in state Y, who ought to be allocated the carbon emitted? If X offsets carbon in Y due to most emissions happening there, does this not create a win-win situation? The argument is certainly enticing; however, we shall now explore some of the issues surrounding carbon offsetting.

# Carbon Offsetting: Local solutions, but large-scale issues

This part of the essay will now look at achieving carbon neutrality in the DECC (2009, p. 4) definition ‘[…] through […] offsetting residual emissions […].’We are aware that becoming carbon neutral is a large task, the reduction of GHGs to 1990 levels is something the world must achieve, it thus stays at the high national level, and the supranational level. Not ignoring what local communities can do to become carbon neutral, rather recognising that very much of what local communities want to implement to become carbon neutral is dependent on what happens at a national level, which again often depends on international trends, trade agreements, or regulations (Rauland & Newman, 2015). Thereby, carbon neutrality at an eye level might seem to be more difficult to achieve for most people. However, the idea of offsetting is something the individual, community or even businesses can attempt. Local offsetting, especially in urban areas, has the potential to lower GHG emissions, as well as being easier to plan, implement and cover the cost of, than other, more largescale projects aimed at achieving carbon neutrality (Jo, 2002). Implementing urban forest areas, for example, can play an important part in reducing the local GHG emission of urban areas (Liu & Li, 2012). Liu and Li (2012) discovered that urban forestation in a large industrial city in China helped to store roughly 3% of carbon, compared to the city’s annual fossil fuel emissions. Additionally, the sequestration from the forest offset 0.26% of the city’s total annual emissions. The implementation of urban offsetting also has other factors than mere carbon reduction any policy makers would have to take into consideration (Escobedo, et al., 2010). However, these numbers are rather small, and would have to be implemented alongside other reduction mechanisms to have any meaningful impact (ibid). Even still, there is nothing offsetting can do to compete with the carbon reducing properties of developing alternative, cleaner energy sources, such as renewables (Zhao, et al., 2010; Jo, 2002; Liu & Li, 2012).

## The low efficiency of carbon offsetting

Carbon offsetting is a great way of getting people to do something, however, planting a tree over there, because you do something very disruptive here, is a too idle approach of convincing yourself you are doing something about climate change and reaching carbon neutrality, when in fact you rather move the responsibility over on others (Beder, 2014). The ethics behind the idea of paying off your GHG emissions ought to be considered separately. However, it is the effect of the offsetting that is important, and must be understood if ever carbon offsetting can be a valid policy, regardless of what people feel about it. There are concerns about the effectiveness of carbon offsetting, and further information on the benefits of offsetting is needed to cultivate additional support for the concept (Anderson & Bernauer, 2016). Large scale implementation of carbon offsetting is dependent on arranging and ensuring information on the concept is provided, as well as thoroughly announced when it is rolled out (Ziegler, Schwarzkopf & Hoffmann, 2012). As an example of this, more European travellers take up offsetting compared to Asian travellers, most likely due to the various marketing executed in Europe on the possibilities of carbon offsetting (McLennan, et. al., 2014). Hence, distributing information about the possibilities of the measures available to the public is important for the enabling of carbon offsetting (ibid; Ziegler, Schwarzkopf & Hoffmann, 2012).

## Marketisation of carbon offsetting versus the carbon reducing effects consumers seek

There are benefits to carbon trading, and a need to reduce costs of carbon offsetting to expand the market, creating a viable existence for carbon trading, much like the cost-reduction of solar energy production enabled the market to thrive (Cacho, Lipper & Moss, 2013). It is important to bring smaller traders into the large international market to utilise the maximum capacity, hence the benefits of the carbon trading regime (ibid). However, Cacho, Lipper & Moss (2013) concluded that despite the benefits from growth and reduced costs of carbon trading, it is important to maintain the core purpose of this trading scheme, and ensure that emission reduction remains the primary purpose of the product offered. There are negative effects of placing cost above effect when offering consumers climate friendly products or carbon offsetting schemes they can pay into, especially if the company is attempting to increase revenue, or the main selling point is reducing the consumer’s costs rather than offering them effective carbon offsetting (Walker & Wen, 2012; Liu, Chen & He, 2015). Additionally, as Walker and Wen (2012) states, for companies to offer actual environmental alternatives neither is to the companies’ financial detriment nor benefit, however, green-washing a product harms the company financially as it drives away customers looking for green alternatives. Hence, offering effective offsetting products to consumers is not only important for the achievement of carbon neutrality through offsetting, but also for a company’s own financial status (Dahl, 2010; Walker & Wen, 2012).

## Issues with large-scale carbon offsetting

There are many issues with carbon offsetting, especially the volunteered offsetting and the idea of trading carbon emissions to achieve carbon neutrality (Rauland & Newman, 2015; Beder, 2014; Clark, 2011). The idea of being able to make a minor contribution towards something over yonder and you can keep on doing as you always have (Beder, 2014; Monbiot, 2006). Smith (2007) equates this to the old catholic practice of sinners paying the church indulges to reduce the effect of their sins. You pay the price so someone, somewhere else can pick up the slack after you (Monbiot, 2006; Beder, 2014). Additionally, the idea of moving your emissions to another location, and thereby ignoring whatever happens locally is not feasible, as there exists scientific recommendations for implementing carbon reduction efforts globally and not just in the global south (Rauland & Newman, 2015). This is where the scepticism arises, not at the idea of some being able to buy off their emission, however, it is rather at the potential that both governments and individuals alike use offsetting to excuse themselves away from undergoing the larger systematic changes that are necessary to achieve carbon neutrality (Rauland & Newman, 2015).

‘Carbon offsets are a greenwashing mechanism that enables individuals to buy themselves green credentials without actually changing their consumption habits, and nations to avoid the more difficult structural and regulatory change necessary to prevent [climate change]’ (Beder, 2014).

Additionally, the effectiveness of offering a specific carbon offset could, potentially, not prove as effective as assumed (Clark, 2011). Beder (2014) uses the example of more efficient wood burning stoves in Cambodia as a project they offered air travellers to purchase offsetting towards. However, Cambodia is already a part of the range of developing nations who already works to achieve GHG emission cuts, and maybe such an upgrade was already in the works. Thereby, any potential offsetting into projects risk being accounted for twice; once as an offset facilitated by the airliner and once as a national GHG emission cut for Cambodia (Clark, 2011; Beder, 2014). Here we have discussed how there are issues with offsetting, however there exists a strong case for locally offsetting to reduce GHG emissions (Lansing, 2012). Although, as Lansing (2012) explains, the establishment of large-scale international offsetting requires a higher degree of priority from policy makers, as well as more research and testing on such international offsetting. This exemplifies the issues contained within the implementation of large-scale carbon offsetting as we have outlined in the above discussion (Rauland & Newman, 2015; Beder, 2014; Clark, 2011).

# Conclusion

This essay has reviewed a definition of carbon neutrality in order to demonstrate that the topics emphasised are vital for that definition to be a functional one. A vital part of carbon neutrality is ‘[…] reducing […] emissions […]’ (DECC, 2009, p. 4) and we have demonstrated how embodied carbon needs to feature within the process of accounting for these emissions. However, we still recognise issues with scoping embodied carbon. Further, the process of carbon offsetting within the definition of carbon neutrality has promises, however there are issues with large-scale implementation and especially certain issues within the voluntary offsetting market. The definition of carbon neutrality has been critically analysed, not with regards to the definitions wording however, but rather by what aspects we have deemed important that the definition encompasses. We have questioned the issue of calculating emissions in order to reduce them without accounting for embodied carbon and questioned the issue of offsetting residual emissions by critically analysing carbon offsetting. Hence, this essay defined carbon neutrality by critically engaging with an already existing definition and adding important factors perceived as needed to make this definition a sound one.

# References

ANDERSON, B. & BERNAUER, T., 2016. How much carbon offsetting and where? Implications of efficiency, effectiveness, and ethicality considerations for public opinion formation. *Energy Policy* [online]. **94**(July), pp. 387-395. [viewed 07 December 2017]. Available from: <https://doi.org/10.1016/j.enpol.2016.04.016>.

BEDER, S., 2014. Carbon offsets can do more environmental harm than good [online]. *The Conversation*. 28 May. [viewed 12 December 2017]. Available from: <https://theconversation.com/carbon-offsets-can-do-more-environmental-harm-than-good-26593>.

CACHO, O.J., LIPPER, L. & MOSS, J., 2013. Transaction costs of carbon offset projects: A comparative study. *Ecological Economics* [online]. **88**(April), pp. 232-243. [viewed 07 December 2017]. Available from: <https://doi.org/10.1016/j.ecolecon.2012.12.008>.

CLARK, D., 2011. A complete guide to carbon offsetting. *The Guardian* [online]. 16 September. [viewed 12 December 2017]. Available from: <https://www.theguardian.com/environment/2011/sep/16/carbon-offset-projects-carbon-emissions>.

DAHL, R., 2010. Green Washing: Do You Know What You’re Buying? *Environmental Health Perspectives* [online]. **118**(6), pp. 246-252. [viewed 10 December 2017]. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2898878/>.

DEPARTMENT OF ENERGY AND CLIMATE CHANGE, 2009. *Guidance on Carbon Neutrality*. London: Department of Energy and Climate Change. [viewed 13 December 2017]. Available from: [http://webarchive.nationalarchives.gov.uk/20121217170313/http://www.decc.gov.uk/assets/decc/what%20we%20do/a%20low%20carbon%20uk/carbonneutrality/1\_20090930090921\_e\_@@\_carbonneutralityguidance.pdf](http://webarchive.nationalarchives.gov.uk/20121217170313/http%3A/www.decc.gov.uk/assets/decc/what%20we%20do/a%20low%20carbon%20uk/carbonneutrality/1_20090930090921_e_%40%40_carbonneutralityguidance.pdf).

ESCOBEDO, F., VARELA, S., ZHAO, M., WAGNER, J.E & ZIPPERER, W., 2010. Analyzing the efficacy of subtropical urban forests in offsetting carbon emissions from cities. *Environmental Science & Policy* [online]. **13**(5), pp. 362-372. [viewed 10 December 2017]. Available from: <https://doi.org/10.1016/j.envsci.2010.03.009>.

GAN, V.J.L., CHENG, J.C.P., LO, I.M.C. & CHAN, C.M., 2017. Developing a CO2-e accounting method for quantification and analysis of embodied carbon in high-rise buildings. *Journal of Cleaner Production* [online]. **141**(10), pp. 825-836. [viewed 13 December 2017]. Available from: <https://doi.org/10.1016/j.jclepro.2016.09.126>.

HAYES, O. & POWELL, D., 2017. *The Man From Shell*. Sustainababble. 3 December 2017. viewed 17 December 2017]. Available from: <http://www.sustainababble.fish/?p=586>.

JO, H., 2002. Impacts of urban greenspace on offsetting carbon emissions for middle Korea. *Journal of Environmental Management* [online]. **64**(2), pp. 115-126. [viewed 10 December 2017]. Available from: <https://doi.org/10.1006/jema.2001.0491>.

LANSING, D.M., 2012. Realizing Carbon's Value: Discourse and Calculation in the Production of Carbon Forestry Offsets in Costa Rica. In: NEWELL, P., BOYKOFF, M. & BOYD, E. *The New Carbon Economy* [online]. Chichester: Wiley-Blackwell. [viewed 15 December 2017]. Available from: <https://www.dawsonera.com/readonline/9781118315934/startPage/145/1>.

LIU, C. & LI, X., 2012. Carbon storage and sequestration by urban forests in Shenyang, China. *Urban Forestry & Urban Greening* [online]. **11**(2), pp. 121-128. [viewed 10 December 2017]. Available from: <https://doi.org/10.1016/j.ufug.2011.03.002>.

LIU, L., CHEN, R. & HE, F., 2015. How to promote purchase of carbon offset products: Labeling vs. calculation? *Journal of Business Research* [online]. **68**(5), pp. 942-948. [viewed 12 December 2017]. Available from: <https://doi.org/10.1016/j.jbusres.2014.09.021>.

MCLENNAN, C.J., BECKEN, S., BATTYE R. & SO, K.K.F., 2014. Voluntary carbon offsetting: Who does it? *Tourism Management* [online]. **45**(December), pp. 194-198. [viewed 07 December 2017]. Available from: <https://doi.org/10.1016/j.tourman.2014.04.009>.

MONBIOT, G., 2006. Paying for our sins. *The Guardian* [online]. 18 October. [viewed 12 December 2017]. Available from: <https://www.theguardian.com/environment/2006/oct/18/green.guardiansocietysupplement>.

PEARCE, F., 2016. Can We Reduce CO2 Emissions And Grow the Global Economy? [online]. *Yale Environment 360*. 14 April. [viewed 12 December 2017]. Available from: <http://e360.yale.edu/features/can_we_reduce_co2_emissions_and_grow_global_economy>.

PETERS, G.P., 2010. Carbon footprints and embodied carbon at multiple scales. *Current Opinion in Environmental Sustainability* [online]. **2**(4), pp. 245-250. [viewed 15 December 2017]. Available from: <https://doi.org/10.1016/j.cosust.2010.05.004>.

RAULAND, V. & NEWMAN, P., 2015. *Decarbonising Cities: Mainstreaming Low Carbon Urban Development* [online]. Cham: Springer. [viewed 12 December 2017]. Available from: <https://doi-org.gcu.idm.oclc.org/10.1007/978-3-319-15506-7>.

ROIBÁS, L., LOISEAU, E. & HOSPIDO, A., 2017. Determination of the carbon footprint of all Galician production and consumption activities: Lessons learnt and guidelines for policymakers. *Journal of Environmental Management* [online]. **198**(1), pp. 289-299. [viewed 15 December 2017]. Available from: <https://doi.org/10.1016/j.jenvman.2017.04.071>.

SMITH, K., 2007. *The Carbon Natural Myth: Offset Indulgences for your Climate Sins* [online]. Amsterdam: Transnational Institute. [viewed 12 December 2017]. Available from: <http://www.carbontradewatch.org/pubs/carbon_neutral_myth.pdf>.

VAUGHN, A., 2016. Zero carbon emissions target to be enshrined in UK law. *The Guardian* [online]. 14 March. [viewed 12 December 2017]. Available from: <https://www.theguardian.com/environment/2016/mar/14/zero-carbon-emissions-target-enshrined-uk-law>.

WALKER, K. & WEN, F., 2012. The Harm of Symbolic Actions and Green-Washing: Corporate Actions and Communications on Environmental Performance and Their Financial Implications. *Journal of Business Ethics* [online]. **109**(2), pp. 227-242. [viewed 10 December 2017]. Available from: <https://link-springer-com.gcu.idm.oclc.org/article/10.1007/s10551-011-1122-4>.

ZHAO, M., KONG, Z., ESCOBEDO, F.J. & JUN GAO, J., 2010. Impacts of urban forests on offsetting carbon emissions from industrial energy use in Hangzhou, China. *Journal of Environmental Management* [online]. **91**(4), pp. 807-813. [viewed 10 December 2017]. Available from: <https://doi.org/10.1016/j.jenvman.2009.10.010>.

ZIEGLER, A., SCHWARZKOPF, J. & HOFFMANN, V.H., 2012. Stated versus revealed knowledge: Determinants of offsetting CO2 emissions from fuel consumption in vehicle use. *Energy policy* [online]. **40**(January), pp. 422-431. [viewed 12 December 2017]. Available from: <https://doi.org/10.1016/j.enpol.2011.10.027>.