Watching the Wind Blow By: A Theoretical Framework for Improving Energy Justice in the UK

Rupert Cope

Bournemouth University Faculty of Science and Technology

the award for which the degree of Masters by Research (MRes) is submitted in partial fulfilment of its requirements

Submitted September 2018

Abstract

For over thirty years the Brundtland's Commission's definition has been widely accepted as the general definition of what sustainable development is. However, there is increasing academic discourse suggesting that aspects of the Brundtland's definition are inadvertently limiting the potential of contemporary sustainability from the perspectives of both horizontal and vertical actors both nationally and internationally.

Through a lack of a clear measuring tool of what effective sustainable development is under Brundtland's definition, differing interpretations (either deliberately or subconsciously) can be made leading to competing interests between the environmental, economic and social pillars of the based on the interpreter's subjective interests.

Using an overarching definition of SD that overlooks or simplifies varying wants and needs of individuals and groups within a single society this can result in the production of unbalanced policy measures. These unbalanced policies then hamper significant advancement of sustainable technology implementation as they fail to adequately reflect these varied and competing needs.

The UK is demonstrating such scenarios in which the skewed application of sustainable development is creating growing numbers of injustice.

Increasing competition between economic growth and ecological protection twinned with unclear legislative definitions with regards to the UKs offshore wind industry are producing obstacles for planners in successfully applying for planning permission. Simultaneously, increasing socio-economic divides are creating compounded environmental injustices arising within coastal communities, when attempting to

achieve sustainable development goals. Injustices such as inadequate individual and/or community involvement during the procedural and administrative phases of the planning and implementation stages of nationally significant offshore infrastructure projects.

Evidence demonstrates that current national and regional energy policies are producing increased numbers of households qualifying as fuel poor, due to increasing costs of energy bills coupled with outdated and inefficient residential heating systems. Furthermore, not only are the numbers of households falling into fuel poverty increasing, but the gap between those who are and are not deemed as fuel poor is becoming larger. This creates greater social divisions of inequity throughout the UK, whilst the benefits of energy infrastructures are limited to a privileged minority of society.

Utilising social justice aspects as the basis for an alternative framework model, this paper explores the potential for providing improved levels of ecological, environmental and energy justice within the UK offshore wind industry to reverse these growing trends of unequitable distributions. Comparisons of case studies implemented in Denmark with those in the UK demonstrate how such autarkic framework-based wind projects can significantly improve regional and community levels of sustainable development, on both an intergenerational and intragenerational basis.

Table of Contents

List of Illustrations

This work is dedicated to my loving mother, Jennifer.
You always supported my hopes and dreams and one of my biggest regrets is that you were not able to see me finish this work.

I will miss you, always.

Acknowledgments

Firstly, I would like to thank my supervisory Team Tilak Ginige and Iain Green who without their continuous and invaluable academic and personal support throughout the entirety of my research, I would not have been able to have made it through.
Next, I would also like to thank both Andrew Whittington and Kerry Barrass, who without their academic support and input this research would not have been possible.

I would also like to thank my fiancée Lauren Sewell, who without her unwavering personal support from day one, I would not be where I am today (and miraculously all whilst completing her own PhD!)
Lauren, you have truly been my rock and best friend.

Finally, I would like to thank my father, Jeffrey. Since the day I was born you have continuously guided me, taught me and supported me through even the darkest days. You are and always will be my idol, I hope this work will contribute in some small way towards repaying everything you do for me.

Chapter 1 – Introduction

1.1 Background to the research

The Industrial Revolution brought a significant increase in global commerce and the economic benefits it brought the UK are still apparent. Increased income and low cost of energy sources helped to provide a solid foundation for Britain's global economic success (Allen, 2009). The widespread introduction of factories to Britain, together with mass production facilitated by new machinery technologies, required huge supplies of power. This was predominantly supplied by the burning of fossil fuels with a high carbon content, such as coal, which was relatively cheap in cost when compared to prices amongst other industrial nations of the time (Allen, 2009).

However, the cost of such economic growth came at a price for the UK's environment with resource depletion and environmental damage occurring as a result (Clapp, 2014). As science has developed, it has led to an improved understanding of existing and potential impacts of such environmentally harmful processes of human activities powered by fossil fuels (Stocker et al. 2013) and how such detrimental impacts affect human and non-human entities.

One example being the rapid increase of atmospheric levels of carbon dioxide and other greenhouse gases by 43 per cent since 1950 (Santer et al. 1996, Ramaswamy et al. 2006), leading to global average surface temperatures to increase of approximately 0.8°C since the early 20th Century. (NASA, [online]). Serious impacts due to such temperature increases have the potential to expose millions of people worldwide to life-threatening heat waves, water shortages and coastal flooding (IPCC, 2018). Increase in

surface temperatures could lead to greater habitat losses for various flora and fauna species and negatively impact crop yields amongst numerous regions across the globe. Furthermore, detrimental impacts (Particularly for small island nations and coastal communities) caused by a 2°C surface temperature increase could see between 32 to 80 million people effected by a global mean increase in sea levels (IPCC, 2018).

Such scientific evidence has led to national governments and international bodies to search for cleaner sources of energy as fuel to satisfy human needs (i.e. fuel source/s that does not diminish natural resources) to limit the contribution of greenhouse gases to the acceleration in global surface temperatures. The challenge is to achieve this without undermining the integrity and stability of existing natural systems. This has been termed 'sustainable development'.

The most commonly used definition of such process is found in the Brundtland Commission's report *Our Common Future* (World Commission on Environment and Development 1987, p.43), where it is given as:

> "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Since the Brundtland Report, several international environmental protocols have been introduced, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. These sought to improve the protection of the world's biodiversity by transitioning signatories into phasing out carbon-emitting technologies (Kemp et al, 1998, Markard et al. 2012). The UNFCCC was negotiated at the Earth Summit in Rio de Janeiro in 1992, with its main objective being to achieve

> "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." (UNFCCC, 1997.Article 2)

The Kyoto Protocol -adopted in 1997 and coming into force in 2005- extended the UNFCCC commitment of State Parties to reducing their greenhouse gas emissions between 2008 to 2012 by at least 5 per cent below 1990 emission levels. A second commitment period followed, implemented as the Doha Amendment to the protocol. This started in 2012 and runs until 2020.

Within the EU, further international legislative instruments have been introduced to stimulate the continued commitment of signatories towards replacing fossil fuel-based energy generation technologies with renewable technologies. The Renewable Energy Directive 2009/28/EC (RED), amending the earlier enacted Directive on Electricity Production from Renewable Energy Sources, (Directive 2001/77/EC), legally obliges all member states of the European Union to meet:

> "mandatory national targets consistent with a 20 per cent share of energy from renewable sources and a 10 per cent share of energy from renewable sources in transport in Community energy consumption by 2020." (United Nations, 2015, para.13)

From this collective figure, each member state will have to contribute their own set amount.

One standout international example of how to successfully transition from an extreme reliance on fossil fuels to renewable energy is demonstrated by the nation of Denmark. Denmark successfully transitioned from being almost 100 percent dependant on imported fossil fuels such as oil and coal to power its power plants at the beginning of the 1970s, to becoming a contemporary net exporter of renewable energy to other EU member states (Moller, 2010).

More recently in 2015, the United Nations also introduced a collective set of people-centred goals and targets, as part of a new sustainable development agenda. These aimed to improve various forms of justice across the globe, whilst building upon previous action plans for the betterment of global sustainable development. The ambitions of this action include eradicating poverty and hunger, protecting the planet from deterioration through improved sustainable consumption and production methods, and increasing infrastructure investment to help promote more resilient sustainable industrialization and fostering greater innovation. It is intended that these aims should be delivered throughout all aspects of regional, national and international societies in a peaceful and just manner, ensuring that maximum economic, social and technological progress occurs in harmony with nature (United Nations, 2015).

Despite such publicised international legal commitments however, problems within the 'phasing out' transition of carbon-fuelled technologies are becoming increasingly obvious.

Top-down perspectives within the design of policies with the aim of discontinuing such technologies are being deemed as too narrow; centralised perceptions with the primary focus of achieving nationally set renewable consumption targets overshadow the potential social impacts and concerns of the communities whose livelihoods were predominantly reliant on fossil fuelled technology, such as coal (Johnstone and Hielscher, 2017; ETUC, 2016).

Alice Mah's analysis of the impacts of de-industrialization within a number of communities demonstrate how industrial decline has led to widespread socio-economic polarization, resulting in the uneven/unjust growth of social and economic deprivation,

depopulation, unemployment, the dilapidation of housing stock, and weak levels of infrastructure and service provision (Mah, 2012).

In the UK, coastal communities are particularly demonstrating growing levels of significant negative socio-economic trends that in turn threaten individual and household health and well-being.

Firstly, evidence demonstrates a widening economic gap between coastal and non-coastal communities, with economic output (GVA) per capita increasing from 23 per cent lower in coastal communities compared with non-coastal communities in 1997, to 26 per cent in 2015.

In 2016, 10 of the bottom 20 local authorities in terms of economic output per head (Gross Value Added (GVA)) were in coastal communities, with 85 per cent of local coastal authorities overall having mean pay levels below the average across the UK. At the same time, five of the 10 local authorities in the UK with the lowest average employee pay, are identified as coastal communities. Unemployment rates were similarly poor; in March 2017, five of the top 10 local authorities with the highest rates of unemployment were coastal communities. Finally, between the top 20 local authorities in England & Wales with the highest proportion of individuals in poor health, 10 are identified in coastal areas (Corfe, Social Market Foundation, 2017).

This growing socio-economic deficit in specific regions, coupled with increasing energy and housing prices, is fuelling the problem of affordability as a serious justice concern across the UK. Increasing numbers of households are spending more than 10 per cent of their income on energy and are becoming identifiable as 'fuel poor', whilst having

difficulties heating their homes adequately (Department for Business, Energy and Industrial Strategy, 2018). This threat of fuel poverty acts to compound environmental and energy injustices in households, which then significantly increases threats to individual's physical and mental wellbeing (Sovacool, 2013; Liddell et al., 2012).

Up until 2015, The UKs progress towards achieving the targets set out in RED was generally positive. According to the Department of Energy and Climate Change (DECC)'s DUKES Report, (2015) wind energy (onshore 35 per cent and offshore 18 per cent respectively) was the UK's largest contributor of electricity from renewable sources by the end of 2014. 7.0 per cent of energy consumption in 2014 came from renewable sources, up from 5.6 per cent in 2013 (DECC 2015, p.157).

Solar photovoltaic (PV) power generation also showed significant progress in contributing towards the UK's RED commitments, more than doubling in 2014 to 4.1TWh.PV generation capacity increased 89 per cent from that of 2013, growing to 5.4 GW from 2.9 GW (DECC 2015, p.162).

However, despite such progress, Energy Secretary Amber Rudd declared in June 2015 that the then Conservative government would end subsidies under the Renewable Obligation (RO) across Great Britain, for new installations of solar photovoltaic systems with a capacity of 5 MW and below. This came into effect in April 2016 (DECC, 2015a).

Such a retraction of funding curtailed the overall support for this commodity and acted to discourage future investors and users. This has resulted in a substantial and untimely deceleration of the photovoltaic contribution towards the UK 2020 targets (Solar Trade Association, 2018), at a time when they had been significantly increasing.

The retraction of top-down policy support of such particular forms of renewable sources leaves wind power as the leading zero carbon emitting technology contributing to the UK's progress towards legally binding targets under the RED. However, despite onshore wind continuing to be the leading individual technology for the generation of electricity from renewable sources in 2014, the Energy Secretary addressed Parliament in 2015, deeming it "appropriate to curtail further subsidised deployment of onshore wind" one year earlier than initially intended.

This retraction of financial support for onshore wind development, matched with the limited scope for radical advancement in other sectors and the Governments stated intentions to make 'full use' of the potential from offshore wind (DECC, 2009), leaves the offshore wind sector as the clear, current standout zero emission candidate which will enable the UK to achieve its RED targets on time and beyond.

However, uncertainty remains surrounding the offshore wind farm sector (Masden et al. 2015). Growing environmental concerns, coupled with competition between social, economic and political interests surrounding use of the seas, raise questions of whether such industrialisation of the marine environment will remain sustainable. (Norgaard, 1988).

The recent repost of the RED highlights the importance of community and individual citizens in playing a central role in the energy transition away from fossil fuels. The recast RED aims for community energy projects

> "To provide environmental, economic or social community benefits for its members or the local areas where it operates rather than financial profits". ((Recast Renewable Energy Directive, Art 2.16c) Savaresi, 2019).

Despite such objectives being signalled under the recast Directive, it provides little detail on specific methods to be used for establishing such community projects (Savaresi, 2019). Each Member State is therefore left to design their own frameworks for strengthening local level equity through community energy projects. Yet, designing and implementing such strategies to provide a truly holistic representation of sustainable development and beneficial distribution continues to be a complicated challenge for by local policy makers and planners alike. Problems such as each potential project being relatively subjective, combined with such relatively limited instructions on pre-planning and installation procedures from top-down sources contribute to the complexity developers face in putting the aims of the RED into practice.

1.2 Introduction

As the UK moves within one year of the 2020 deadline for the achievement of the legally binding target under the Renewable Energy Directive 2009/28EC, there is a growing concern that the likelihood of achieving such targets will be missed. Not only will this highlight the UK's shortcomings in developing to an adequate level of sustainability, but it will highlight a lack of serious commitment to protecting the environment, and thus lives, globally.

The rapid rise of the Earth's average surface temperature has been largely attributed to the release of roughly 37 billion tonnes of carbon dioxide through human activity (Horton, 2014), which has resulted in 'climate change' being recognised as a fundamental threat to the global population (Orimoloye et al., 2019; IPPC, 2018, Campbell-Lendrum and Corvalán, 2007).

Mutually agreed action has already been initiated by many states – including the UK, through signing the United Nations Framework Convention on Climate Change in an effort to promote energy security whilst achieving no more than a 2°C increase in the global climate temperature. This would avoid potentially life-threatening and irreversible environmental damage (IPCC, 2018).

There is also growing concern that this milestone may already have been passed (Mauritsen and Pincus, 2017; Raftery et al., 2017Caldeira et al., 2003). It is certain that a greater uptake in renewable energy is needed urgently in order to mitigate the worst potential effects of climate change (Tong and Ebi, 2019; McMichael and Lindgren, 2011; King, 2004).

The UK government's white paper The Carbon Plan: Delivering our low carbon future (DECC,2011) emphasises the fact that the aim should be to tackle market failures and unblock barriers to investment, both of which will encourage growth in 'greener' technologies.

This shift in policy demonstrated the government's genuine commitment to addressing the threat of climate change by reducing its nationwide levels of carbon emissions. However, in light of the reliance on Brundtland's definition of sustainable development for designing national policies, its vagueness in measurement and application creates substantial limitations in implementing effective sustainable development from varying perspectives.

For example, a prerequisite to increasing the number of renewable energy projects such as offshore wind farms is the identification of suitable sites which must include the relevant natural energy source. This need for appropriate sites, often means that a project may be constructed in an environmentally sensitive area in order to obtain an efficient energy output. From an ecological justice perspective, this is highly undesirable.

This can cause a conflict between the commitment of carbon neutral energy production and the need to protect habitats and prevent biodiversity loss and reduction of ecological resilience.

The majority of legal instruments which provide protection for the affected habitats, have been introduced through European Union Directives. They have then been transposed by states using their own individual methods. Environmental Impact Assessment (EIA) was introduced in the European Union in 1985 by the EIA Directive

(85/337/EEC) and is currently one of the main tools used by planners in the UK to maintain a balance between installing a Nationally Significant Infrastructure Project (NSIP) and mitigating for the harm caused by the project to the natural environment. This has since been amended on a number of occasions, the latest amendments being entered into force on 15 May 2014 in an attempt to provide improved regulatory methods. These amendments paid greater attention to, and assessment of, the potential threats and impacts to the environment posed by a proposed renewable project.

The social justice perspective argues that the use of such an overarching, simplified definition of sustainable development based upon the Brundtland definition will encourage competing views of the application of sustainability in newly introduced policies. For instance, central Government's interactions with citizens through unbalanced (or perceived to be) policy enactments based on the sole focus for achieving nationally set renewable consumption targets has the potential to overlook the diverse social impacts and concerns of affected communities (p 46, ETUC, 2016). By overlooking or simplifying the varying wants and needs of individuals and groups within a single society, the result is the production of unbalanced policy applications, particularly between economic growth and social wellbeing. These unbalanced policies, particularly between economic growth and social wellbeing then hamper any significant advancement of sustainable technology implementation as they fail to equitably reflect these varied and competing needs (Weinstein et al., 2007; Weinstein and Reed, 2005). Furthermore, by reducing energy availability through deindustrialization of fossil fuel sourced technologies without replacing energy sources with a readily available sustainable alternative encourages energy injustices to grow in the shape of fuel poverty (Ramos-Mejía, Franco-Garcia and Jauregui-Becker, 2018; EUTC, 2016).

This has led to distrusting perceptions from a regional and local level perspective; with ground level interpretations being that the top-down rationale for offshore wind industry support is primarily based on economic gain and less concerned with ecological and social needs. Furthermore, such policy enactment rationales heavily weighted with a narrow focus of achieving nationally set renewable consumption targets, have the serious potential to overlook the diverse social impacts and concerns of communities (Johnstone and Hielscher, 2017).

Simultaneously, top-down policies that restrict or remove financial support for greener energy sources build upon the existing distrust of centralised action through infrastructure procedures, promoting resistance to any change in energy production for fear of smaller community and individual needs being further overlooked.

According to the Department of Energy and Climate Change (DECC)'s DUKES Report, (2015) wind energy (onshore 35 per cent and offshore 18 per cent respectively) was the UK's largest contributor of electricity from renewable sources by the end of 2014. Progress was demonstrated generally, with 7.0 per cent of energy consumption in 2014 coming from renewable sources, up from 5.6 per cent in 2013 (DECC 2015, p.157). Solar photovoltaic power generation also showed significant progress in contributing towards the UK's RED commitments by more than doubling in 2014 to 4.1TWh. Capacity increased 89 per cent from that of 2013, growing to 5.4 GW from 2.9 GW. (DECC 2015).

Despite such progress, Energy Secretary Amber Rudd declared in June 2015 that the then Conservative government would end subsidies under the Renewable Obligation (RO) across Great Britain, for new installations of solar photovoltaic systems with a capacity of 5 MW and below. This came into effect in April 2016 (DECC, 2015a).

Such a retraction of funding undoubtedly damages the overall support for this commodity and discourages future investors and users. This causes in a slowing of the photovoltaic contribution to 2020 targets, when they had been increasing.

As a result, wind power has become the leading zero carbon emitting technology contributing to the UK's progress towards legally binding targets under the RED. However, despite onshore wind continuing to be the leading individual technology for the generation of electricity from renewable sources in 2014, the Energy Secretary addressed Parliament in 2015, deeming it "appropriate to curtail further subsidised deployment of onshore wind" one year earlier than initially intended.

With the final target date of 2020 soon to be reached, this curtailing of financial support for onshore wind development, twinned with the limited scope for radical advancement in other sectors, leaves the offshore wind sector as the standout zero emission candidate which will enable the UK to achieve its RED targets. The UK Government has echoed its intentions to make 'full use' of the potential from offshore wind power (DECC, 2009).

The recent recast of the 2018 EU Renewable Energy Directive advocates for greater provisions to formulate increase grassroot sources of energy, with ownership and management centred partially or fully within the subjected communities throughout EU member states by 2021 (Savaresi, 2019).

The application of the recast RED would address the UK government policy measures in a way that would reduce community level access to energy and potentially combat the growing trends of energy injustice. By requiring Member States to adopt 'enabling frameworks to promote and facilitate' both renewable energy communities and renewable self-consumption, it would remove unjustified regulatory and administrative

barriers (Saveresi, 2019), such as demonstrated by the removal of subsidies for new installations of renewable projects possessing a capacity of 5 MW and below (DECC, 2015a).

Considering this recent recast of the RED and the growing impact that deindustrialization is having within UK communities,[1] lies the potential for several coastal community projects to be initiated across the UK to reverse the negative trends of ecological, environmental, social and energy injustices.

By adopting an alternative framework that transforms the 'de-industrialization' process into one of a 'super-industrialization' process (Huber, 1982, 1985), the UK can modernise its energy systems to overcome environmental crisis, without limiting development and at the same time enhancing equitable application of sustainability.

Focussing on the UK's offshore wind energy sector, this research will first analyse the ways in which current policy mechanisms are employed during the multiple phases of an offshore wind farm's lifespan. It will then assess the current UK practices and their interactions with key principles of sustainable development such as biodiversity retention, public participation, environmental and energy justice.

The utilisation of offshore wind energy is supported by the recast of the RED, current UK Government policy agenda favouring promotion of offshore wind development and the capacity potential of UK wind industry due to its geographic location.

By 2011, UK offshore wind energy had an operational capacity of 1.3 GW across 15 wind farms. (DECC, 2011). Furthermore, current estimates show cost reductions to be

[1] See for example Alice Mah; *Industrial Ruination, Community and Place: Landscapes and Legacies of Urban Decline* (2012). Toronto: University of Toronto.

most pronounced for electricity technologies, particularly using offshore wind and solar PV. By contrast, the cost of generating heat and electricity from fossil fuels is expected to rise towards 2020 and beyond (Renewable Energy Roadmap, 2011a. p.18, figure 5).

This thesis will employ specific case studies such as Denmark to identify alternative policy examples that may provide a more holistic application of sustainable developments. Particular examples include provisions of more equitable distributions of costs and benefits. Building on obligations devolved from the Aarhus Convention, bottom-up focussed energy sector procedures and community-driven management could lead to enhanced forms of social justice being applied.

The provision of greater public participation has also long been advocated as an integral part of the assessment procedure under the EIA Directive, but this can also stretch beyond community engagement during planning stages.

In the (now defunct) Department of Energy and Climate Change's published Renewable Energy Roadmap, renewable investment is highlighted as potentially providing a significant level of increased employment (DECC 2011a), at a time when record numbers of individuals are struggling to

obtain a suitable level of energy security. Providing improved levels of community engagement through co-ownership programmes, locally focussed employment and educational opportunities arising from a regional based energy project would contribute to improving energy and socio-economic security to millions of UK households. Furthermore, by restructuring development processes within an alternative framework, it could provide improved ecological protection using new, sophisticated clean infrastructure technologies within industrial society (Spaargaren and Mol, 1992).

The Use of floating offshore wind turbines for such projects for example, would enable planners to overcome several barriers persistent with planning applications for NSIPs.

Negative ecological impacts on marine flora and fauna would be severely reduced by removing the requirement of installing fixed foundations. simultaneously, economic costs and complications associated with installation, maintenance and decommissioning the turbines could also be avoided.

Finally, this work will provide a theoretical assessment for the potential to introduce such similar methods in the UK, to resolve the competing objectives within the sustainable development of the UK's offshore wind industry.

1.3 The Present Study – Aims and Objectives

The purpose of this research is to provide a critical analysis of the United Kingdom (UK) current offshore wind industry's application of sustainable development in the context of environmental, ecological, social and energy injustices arising as a result of competing interests.

This work will provide a theoretical analysis of whether such injustices can be reversed by introducing alternative policy designs that are currently being implemented by other EU member states.

It will provide a critical discussion on how to reverse the current UK injustices formed as a result of the competing interests between the facets of sustainable development being employed within the UK during the implementation and management phases of nationally significant offshore wind projects. This research will specifically focus on the following objectives:

1) Critical review of academic literature to provide a general overview of the most readily accepted definition of sustainable development and critically analyse its historical evolution.

2) Application of academic discourse to provide an assessment of the UKs contemporary implementation of the sustainability of developments within the offshore wind energy sector.

3) Examination of the current literature surrounding Brundtland's environmental pillar to provide a theoretical argument for the need of greater ecological justice during the construction, operation and decommissioning of renewable offshore technology.

4) A critical analysis of the sociological aspects of Brundtland's sustainable development pillars focusing on impacts of social, environmental and economic injustices.

5) A critical investigation of the Danish renewable wind energy system and identification of alternative policy instrument that could be applied to the UK renewable energy sector.

1.4 Methodology

This fundamental research critically analyses the extent of the current limitations of the application of sustainable development throughout the planning, installation, operational and decommissioning stages of offshore wind farms within the United Kingdom.

Focussing on the development of current policy mechanisms, this research aims to identify whether competing interests are being created among the aspects of the widely accepted pillars (Social, environmental and ecological) of the Brundtland Report's definition of sustainable development. The research will then analyse how particular injustices (such as environmental, ecological, social and energy injustices) from a bottom-up perspective are being introduced as a result of such competing interests within the UK's wind energy sector.

Finally, it will provide a theoretical evaluation of whether such injustices can be reversed by introducing alternative policy measures that are currently being implemented within other EU member states, here into the UK.

The original method plan of this thesis was to conduct an applied research study to critically analyse whether the contemporary legislation adopted during the planning and installation stages of offshore wind farms in the UK where enabling an adequate application of holistic sustainable development via NSIPs. The method would adopt a primarily traditional legal research approach, initially reviewing academic discourse focussing on the critique of the effectiveness of contemporary EU and UK legislation in question.

The initial stages of the research would be to identify the legislation and policy controls involved during the planning and installation process of NSIP production within the UKs offshore wind energy Sector. This identification would review various primary sources such as legislation enacted by Parliament, European legislation and policy, and case law made by the UK and European Courts using several different statutory books and online legal databases.

Next this research design would look at the historical origins of the legislation and policies identified. Utilising qualitative secondary data from a variety of sources including official government statistics, reports and commentaries from governmental organisations and NGO's, legal and scientific journals and articles for some examples. Such analysis would assist to build a better understanding on how the legislation and policy has evolved in order to produce greater consideration and application of sustainable development in the UKs contemporary energy sector.

The next stage in the methodological process design used secondary data sources such as peer reviewed academic literature, to theoretically evaluate the effectiveness of the legislation and policies employed within the UK offshore wind energy sector concerning such NSIPs, highlighting any limitations regarding the immediate premise of sustainable development.

However, during the research of academic discourse focussing on the effectiveness of the legislation and policies employed, much of the subject literature kept highlighting the sociological influence of the theory of 'justice' and its importance with regards to sustainable development. Particularly when identifying limitations and hindrances caused by competing interests among the individual 'pillars' of the Brundtland definition itself.

Following this, a broader literature review to include the theoretical application of 'justice' with regards sustainable development is conducted, with the decision to change the research criteria from a traditional legal approach to adopt a wider interdisciplinary approach to include sociological, ecological and economic perspectives.

Under these individual perspectives, the research uses critical academic analysis to identify how specific problems are being created by a combination of the UKs current renewable energy transition and existing industry practices. Then by using a combination of academic argument and statistical analysis, identify how specific threats to human health in the form of fuel poverty are being encouraged in particular regions and communities.

The final part of this research identifies effective alternative practice examples demonstrated by specific case studies from the Danish wind industry and how they overcame such similar injustices that are currently present here in the UK. Then considering the above multidisciplinary perspectives, this thesis rationalises whether such methods could be facilitated into the UKs own offshore wind energy sector.

As highlighted above, the original design for the method plan of this thesis was changed from a critical analysis of the application of contemporary legislation in the offshore wind sector was providing an adequate, holistic standard of sustainability to include a more interdisciplinary approach. As discussed in the background of this research, the transition of the energy sector away from the use of fossil fuelled power sources places a much greater requirement for the uptake in more sustainable power sources on national governments.

With regard for this thesis focussing on the offshore wind sector, the rationale basis is

based upon a combination of justifications. The first being centralised sourced restrictions being made through withdrawals of financial support for alternative sources of renewable energy technologies (such as solar prophylactics and onshore wind power) and the UKs favourable geographic location for harnessing potential wind energy. Coincidently, by utilising offshore wind when the UK is unlikely to achieve its renewables target under the Renewable Energy Directive, the incentive for further promoting the UK's leading candidate renewable energy source becomes even more significant.

The adoption of floating wind turbines for such a framework would also contribute to reducing the UKs industrial impact on the local biodiversity whilst enabling improvements being made regarding the efficiency of the energy produced and economic spending. Up to twenty six percent of total costs are spent on installing and decommissioning fixed monopole foundations. Costs involving hiring specialist equipment and time spent at sea for such processes are a serious financial consideration for any planner. Not Only this, but the proven negative impacts of fixed foundations on marine species at and near site can be so severe that a planning application can be rejected on this basis alone. The potential for planners in using alternative construction/deconstruction methods at land to reduce various costs of time, equipment costs and likelihood of ecological damage could therefore significantly reduce planners' project expenditure and improve the probability for the project's planning application being successful. Furthermore, floating turbines in comparison to fixed foundation turbines, can be installed further out at sea in areas where wind measurements are both more consistent and stronger. By harnessing stronger and more consistent levels of wind, it would improve both the efficiency and production of continuous electricity

generation, conveying greater financial returns. Similarly, by siting wind turbines further out to sea could overcome objections to planning permission as visual or noise impacts to the local community/region could also be minimalised.

The motivations for focussing this thesis upon a community perspective are abundant. Firstly, in light of the recent recast of the Renewable Energy Directive in 2018, the importance of community and individual citizens are highlighted in playing a central role in the transitioning the energy industry away from fossil fuels. As a by-product of such an energy transition, various benefits for the community under the premise of sustainable development could be provided, at a time when trends of poverty among coastal communities are increasing both in numbers and severity.

By using the theoretical method of 'super-industrialization' of dilapidated communities that had previously supported themselves with industry but with greener energy sources, not only would greater overall contributions be made to reducing carbon emissions and improving sustainability, but would also introduce substantial, much needed benefits to the subject community.

In terms of a measuring sustainable development, a community focus is favoured in comparison to a larger integrated viewpoint. Particularly when attempting to classify an agreed academic standard of measurement for the effectiveness of applying the legislation, , difficulties arose considering varying EU member states with differing subjective conditions. A particular issue for identifying an overarching satisfactory measurement of sustainable development is highlighted by the potential that each individual, community, region or even nation may harbour differing norms and values from a sociological perspective and so considerations of the basic minimum standard of application requirements regarding each 'pillar' will vary. Consequently, setting a base

evaluation standard to adequately represent all varied interests from a strict objective perspective becomes immensely difficult, inadvertently risking overlooking specific wants/needs of a particular group/individual. Therefore, the rationale to design a theoretical framework primarily focussed on a regional perspective to support an application of a project/s was made in order to better encompasses the wants and needs of a smaller focus group (compared to a significantly larger group containing increasingly varied needs) under the principle of sustainable development.

Regional communities that share similar geographically based norms and values and/or are affected by similar injustices, would be arguably easier to design and implement such a project to adhere to the similar specific wants/needs for, rather than a project or set of projects based on a singular overarching policy framework. Following a wider literature review to include the theoretical application of 'justice', adapting the research criteria to consider a wider interdisciplinary approach ultimately will help to build a much more innovative thesis project, providing a better reflection of the mechanisms of justice that interact within regional sustainable development.

The rationale for using Danish policy as the main comparison to the UK is founded on a series of similarities between the two nations with concern to the principle of sustainable development and particularly within the premise of a prolonged energy transition phase, despite their overall and independent cultural and political differences.

Ultimately the general application of sustainable development will vary in several ways, due to the aforementioned subjective needs and conditions of each nation. finances, geographical locations and features, existing energy structures, future energy

requirements are just some examples of how nations would differ. Similarly, as EU Directives do not have immediate direct effect, different member states may well enact different methods of implementation and self-imposed base standard requirements in order to achieve the overall desired outcome under a directive.

Denmark is a prime example of a nation demonstrating different energy requirements and conditions when compared with the rest of the EU. In the early 1970s, over 90% of Danish energy consumption was fuelled by imported oil (Rüdiger, 2019). However, the oil crisis in 1973 triggered the start of its radical transition from being a predominant importer of fossil fuels into becoming a leading example of promoting green energy policies (Rüdiger, 2019), primarily supported by wind energy.

During this transition phase, Denmark suffered extreme and widespread impacts of fuel poverty. The UK, (whilst not suffering from such a critical energy situation as Denmark had during the 1970s) is exhibiting similar negative regional social impacts instigated by fuel poverty trends.

Furthermore, based on Denmark's geographical location, it creates favourable wind conditions to achieve significant renewable power generation capacity to support its offshore wind energy industry. Similarly, due to its specific geographic characteristics, the UK has a significant potential for building its wind generated renewable capacity within its offshore energy industry.

There exists relatively large catalogue of sound academic evidence to help build a comparison of the two unique standpoints of Denmark and the UK from a multidisciplinary perspective and support valid theoretical proposals for an innovative, alternative policy framework.

However, due to the nature of reliance on predominantly secondary research sources and the lack of existing research evidence into such community owned NSIP models, limitations of this research exist. Firstly, due to the research not focussing on a particular region or community, difficulties may arise in providing a detailed and accurate representation of the injustices affecting that particular community. This would then create difficulty in quantifying such impacts from the competing interests of the pillars of sustainable development.

Similarly, quantifying a detailed description of how fuel poverty is impacting households of that region would also create difficulties in understanding the necessity of a proposed project and the designing of such based on the community's requirements/limitations.

Steps such as conducting closed or open questionnaires /interviews of affected sample regions could alleviate such problems. Gathering statistical evidence could help identify which communities or regions would benefit most/have the greatest requirement for such a project and provide the ability to measure a project's effectiveness in reversing the existing injustice trends in question.

Furthermore, by conducting specified interviews with carefully selected policy experts that would otherwise be concerned with such a project, the research could acquire a more detailed understanding of the potential for such an alternative framework built on the foundations of the original theoretical investigation already conducted. As a result, this would be extremely time consuming and relatively expensive, which would arguably be beyond the remit of this thesis. However, as a result of the theoretical foundations already being laid by this thesis, it would provide the potential for future

research to be conducted into the more detailed and practical viability of implementing such a framework here in the UK.

Chapter 2 - Analysis of Sustainable Development in Contemporary UK

2.1 Introduction

Before any successful implementation of a UK Nationally Significant Infrastructure Project (NSIP) or policy measure, it is necessary to factor in the three main pillars of sustainable development (SD);

> "Sustainable development is about the achievement on a global scale of three principles: economic development, social justice and ecological responsibility" (Low et al 2000, p 6).

From community to international level, all three of these aspects should be carefully addressed. However newer academic discourse suggests that the environmental and societal aspects need to be broader and more effective. (Everard and Longhurst 2018; Soutar and Mitchell 2018)

In this chapter the research will highlight the historical development of SD, using discourse analysis to explore the existing problems and limitations surrounding the current implementation of SD.

2.2 Historical Evolution of Sustainable Development Theory

The Industrial Revolution brought a great increase in commerce globally. However, this caused resource depletion and environmental damage. The widespread introduction of specialist mass production machinery and factories across Britain, required huge

supplies of power. This was predominantly supplied by the burning of fossil fuels with a high carbon content. such as coal (Abram et al., 2017).

During this period, some of the earliest environmental arguments were put forward for increased consideration of the value of natural environments and the threat of unsustainable development. Concerns regarding excessive natural resource exploitation to maximize wealth were voiced from various academic standpoints. There were early warnings concerning the importance of keeping development sustainable in the face of depletion of resources. There was also recognition that the majority of fossil fuels being used in industrial development were finite: “we are sacrificing those ends towards which material wealth is just a means” (Reismann 1987, p.420). An emerging focus on the detrimental impacts of this industrial expansion arose. There were particular attempts to rationalise inequitable behaviours which encouraged industrial projects to over-exploit resources, as 'homo-economicus'; assuming the values of such men to be rational self-interested wealth maximisers, who had little concern for potential negative outcomes of such huge resource exploitation (Dixon and Wilson 2012).

This trend of over-exploitation of finite energy resources continued through the 1950’s, despite growing academic scrutiny of ‘homo-economicus’. Academics began to recognise the that the repercussions of continued unsustainable practices would adversely affect the environment. This would be to such an extent that it would:

> “Merge each nation's affairs with those of every other, more thoroughly than the threat of nuclear war or any other war may already have done.” (Von Neumann 1955, p. 248).

Scientific developments post-World War II, especially in developed nations, allowed for the collection of more detailed environmental evidence. This supported the broadening

scrutiny of unsustainable practices throughout the industrial sector, particularly when understanding the implications of industrial chemical use. One notable example is Rachel Carson (1962), who used improved scientific research to highlight the dangers of the pesticides being used within the agricultural sector, and especially how these had negative impacts on human health and the environment.

Through their work, Carson and others challenged national institutions to take a more active interest in their resource management methods, resulting in the first major international response by the Conference on the Human Environment in Stockholm in1972. Following the Stockholm Conference, the United Nations Environment Programme (UNEP) was created and has since taken a major role in assisting national governments in the implementation of environmentally focussed policies and practices.

In the same year, research on the effects and limits of continued worldwide growth was conducted at the Massachusetts Institute of Technology (MIT), now better known as 'The Limits to Growth', which was commissioned by the Club of Rome. It produced alarming conclusions. The first identified that if the (then) growth trends in industrialisation, pollution, worldwide population, resource depletion and food production remained unchanged, then the maximum capacity of our planet would be reached within the next 100 years. This brought a clearer focus on defining 'sustainability', emphasising the imperative for the preservation of the natural environment.

In 1987 the Brundtland Commission report attempted to bring together contemporary views of what SD actually was. *Our Common Future* defined SD as;

> "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". (Brundtland Commission 1987, p. 43)

Following the publication of the Brundtland Report, this has been accepted as a sound general definition of SD across a wide spectrum of political, economic and social development policies.

Brundtland's definition is based on a dual notion of equity, applied in two ways. The first is the application of equity in an intragenerational manner, aiming to provide an equitable distribution of clean, natural resources and financial opportunities, in a non-discriminatory manner, with full social involvement and social stability amongst the world's existing population. The second is the application of intergenerational equity, through the ethical duty bestowed on the current generations to simultaneously secure (or at least not further diminish) global levels of biodiversity and natural resources through sustainable development. The intention of this is that future generations should inherit the same levels of resource:

> "The next generation should inherit a stock of environmental assets no less than the stock inherited by the previous generation" (Brundtland Commission 1987, p.11).

The United Nations Millennium Ecosystem Assessment (MA) attempted to introduce a sophisticated roadmap showing how to ensure that the 'inherited stock' is at least equally transferred to the next generation. The framework demonstrated that a dynamic interaction exists between people and ecosystems and that environmental assets such as ecosystems provide 'services' which benefit humans both directly and indirectly. To manage these services, the MA framework allocates them into four broad categories: provisioning, regulating, supporting and cultural.

Whilst the MA framework is structured roadmap for maintaining ecosystem development such that their benefits remain for next generations, its clear narrow focus on anthropocentric benefit highlights the difficulty in maintaining equal interests between the environmental and anthropocentric facets of the Brundtland definition. For example, the precise identification of a service as a beneficial endpoint impact of an ecological process on human welfare, emphasises the service provided to humans and little else. In this way, those transactions identified as mere ecological processes become undervalued, despite being vital in maintaining non-human ecosystems (Boyd and Banzhaf, 2007; Fisher and Turner, 2008).

2.3 Contemporary Assessment of Sustainable Development

In September 2015 all 193 member states of the United Nation (UN) formally adopted the Sustainable Development Goals (SDGs), demonstrating worldwide recognition of the importance of the world's finite natural resources in upholding human health and overall well-being. This recognition was implemented through a number of strategies under the MA Framework (MDGs) consisting of 17 goals and 169. These aimed to improve economic growth, social equality and the mitigation of detrimental impacts of climate change by 2030 (Gupta and Vegelin, 2016; UK Cabinet Office 2017). However, some academics perceive the current effectiveness of SDGs to be limited by a fragmentation of their implementation on both a national and international scale (Horton, 2014). Arguably whilst the UKs SDG implementation strategies are still in relative infancy, a more cohesive implementation is needed for the satisfactory

achievement of such goals, from the perspective of both horizontal and vertical actors (Stafford-Smith et al., 2016).

2.4 Lack of a Clear Measuring Tool

One of the major problems with the Brundtland definition of equity being primarily founded on moral values, is that it may be subject to a range of interpretations. It provides no specific or widely accepted form of measurement process to identify development limits of various industrial sectors and the management of natural resources. This problem has been openly addressed by those policy makers seeking to enhance SD. For example, in Chapter 40.4 of Agenda 21 this need for indicators was emphasised:

> "indicators of sustainable development need to be developed to provide solid bases for decision making at all levels and to contribute to a self-regulatory sustainability of integrated environment and development systems" (United Nations 1992, p.346).

Arguably however, the proscription of a blanket requirements check list for effective SD, could shift the focus away from the historic meaning of sustainability – one of strict preservation – to a position that allows for compromise or the prioritisation of economic growth over natural resources. Permitting such substitutions of natural capital for the generation of human based (production) capital, reflects the narrow or 'weak sustainability' perspective in relation to environmental economics; a concept popularised by the works of Robert Solow (1986; 1974) and John Hartwick (1977). Under one potential interpretation, the Brundtland definition could incorporate the weak sustainability perspective by suggesting that we are not obliged to leave our descendants an undiminished stock of fossil fuels such as petroleum, if an alternative source/s of energy can be identified instead (Ayres et al. 1998).

By contrast, the 'strong sustainability' viewpoint more focussed, with stricter preservation of finite resources laid out as a series of thresholds that must not be crossed. The strong sustainability perspective assumes that sources of environmental and human capitals are complementary, but that the former cannot be substituted by the latter (Pelenc and Ballet 2015). However, without a clearly defined measuring tool, defining such threshold restrictions is largely a combination of socially and politically determined preferences that could differ widely between communities and regions (Ekins et al., 2003; Chiesura and de Groot, 2003). Similarly, defining threshold restrictions could prove difficult, considering the varying capacity for resilience across a range of regions; natural resources may be able to recover from manmade, natural of cumulative shocks or stresses in different ways and at different rates (De Groot et al., 2003). The value of a species may vary in different geographical locations when attempting to maintain biodiversity. Without a widely accepted form of measurement, it becomes much more difficult to both identify suitable methods of development and to record levels of impact.

Conversely under Brundtland's need for strong sustainable intergenerational equity, another problematic area arises. In this, current generations may limit development in favour of preservation of natural resources for future generations to 'meet their own needs'. However, future generations' respective wants and (more importantly) needs could change from those that preceded. They could, for example, require the use and depletion of a particular natural resource that had previously been preserved. From a weak sustainability viewpoint this could technically exist within the boundaries of

Brundtland's definition, if that future generation required this to satisfy their own survival (Gough, 2015).

For example, should the current increase of the UK's population continue, policy measures would most likely increase their focus on the need for more housing and food supplies. Arguably then, might the social and economic anthropocentric benefits of regional growth, for example, overshadow the preservation of the natural environment? (Cambridge University Institute for Sustainability Leadership, 2014).

The recent introduction of the Housing and Planning Act 2016 (HPA) and the latest report of the Natural Capital Committee (NCC) (2017) demonstrate that such a scenario may already exist. Through the HPA the UK government proposes the building of more homes in England and Wales, providing economic benefit through the increase of private home sales. Conversely the NCC has made a series of recommendations to government emphasising the need for considerable increase in its protection of environmental capital as an expense of economic growth:

> "The government's 25 Year Environment Plan should be progressed rapidly, if there are to be demonstrable improvements in England's natural capital before 2020...Currently many aspects of the natural environment are still deteriorating; Development of the Plan has been considerably slower than both expected and desired, in part due to the referendum and Brexit" (NCC 2017, p.3).

Unclear definitions and the lack of a specific method/currency of measurement, place substantial limitations on the ability to implement effective SD. This allows development to expand without adequate supervision or regulations regarding their levels of sustainability (Verma and Raghubanshi, 2018). Such a lack of monitoring tools which hold planners accountable for any detrimental outcomes of their projects, could allow uncontrolled exploitation of natural resources and ecosystems (Matthews, Lo and

Byrne, 2015). For example, there is currently no obligation to implement reasonable, sustainable, alternative energy sources during development.

Under the weak sustainability viewpoint, such an absence of remedial measures could lead to an acceleration towards the point of no return, for permanent detrimental effects from a rise in global temperatures – so much so that we may have already (considering the strong sustainability standpoint) have exploited our resources and ecosystems to the point of no return for recovery (Crowther et al. 2017).

Accordingly, academic attempts to better understand and operationalize SD have been continuous, but a clearer overarching international framework remains elusive:

> "This assertion can be confirmed by the length of time the concept has been around (over 25 years), the numerous international conventions and conferences held on sustainable development … and the inclusion of the concept in the development agendas of most, if not all, World nations and regional associations. However, sustainable development is still shrouded in controversy, misunderstanding and misapplication." (Ndah, 2015, p8-9)

This allows differing interpretations to be made which favour particular pillars of Brundtland's definition of SD. Some may take precedence over others, either deliberately or subconsciously, based on the interpreter's subjective interests.

2.5 Competing Interests of Sustainable development

Varying interpretations of SD can create - presumably unintentionally - competition between the environmental, economic and social aspects required in order for development to be considered sustainable. Brundtland's definition specifically has drawn criticism that its use as an overarching definition of SD for newly introduced

policies, will continue to create competing views of what sustainability actually is. This is due to the definition overlooking or simplifying the varying wants and needs of individuals and groups within a single society, resulting in the production of unbalanced policy measures. These unbalanced policies then hamper any significant advancement of sustainable technology implementation as they fail to adequately reflect these varied and competing needs (Weinstein et al., 2007; Weinstein and Reed, 2005):

> "Environmentalists want environmental systems sustained. Consumers want consumption sustained. Workers want jobs sustained…With the term meaning something different for everyone, the quest for sustainable development is off to a cacophonous start." (Norgaard, 1988. p.607).

One example is the ecocentric approach to sustainable development. Ecocentrism is the environmental philosophy focussing on the implications of human activity for the natural ecosystems to which they relate (Hettinger and Throop 1999). At the opposite end of the spectrum we see the philosophical objectives of anthropocentrism. Whilst similar to the viewpoint underlined by the MA framework above, anthropocentrism is more radically based on the viewpoint that all human activities should primarily aim to achieve the best desired outcome for human societal wants and needs, regardless of whether this would adversely impact any aspects of the natural environment (Boddice, 2011). Earlier ecological economic theory focussed on maintaining the value of goods and services underpinning human well-being and demonstrated a more moderate approach to the different interests of varied parties, including the 'natural' capital stocks of society (Dodd 1995). This 'supply side' perspective conceptualizes the challenge of SD as at least maintaining the value of a society's total capital stock over an indefinite future, but still reinforces the predominant focus on human well-being and benefit rather than a wider ecological perspective (Dodd 1997).

Furthermore, a lack of a clear and unified system of measuring SD provides opportunity for deliberate misuse. As long as an individual or group does not breach the generally accepted interpreted definition for their specific area of expertise, they could shape their actions to attain maximum profit from a situation, even if this is in opposition to the consensus of what SD is in other sectors. Timothy O'Riordan (1988, p.30) claims that:

> "[developers] seek to exploit the very ambiguities that give sustainability its staying power. Similarly, environmentalists abuse sustainability by demanding safeguards and compensatory investments that are not always economically or socially just."

Direct evidence of this reasoning was demonstrated during the application for planning permission for the proposed Navitus Bay Wind Park. Under the social aspect of Brundtland's definition in the form of representations made by individual objectors, these blocked much needed environmental measures to implement a clean renewable energy source by highlighting potential economic impacts:

> "I object to industrial seascape it will reduce the value of my house" (Infrastructure Planning Inspectorate, 2015a).

Meanwhile others did not specifically emphasise economic impacts, but still highlighted personal aesthetic impact as their main (or in this example, only) basis for objection:

> "I have a property that looks directly at the area where the construction will take place" (Infrastructure Planning Inspectorate 2015b).

Principles such as ecocentrism and anthropocentrism are at opposite ends of the objective-seeking spectrum and therefore exhibit a dialectical tension; in the absence of conscious change, there is likely to continue to be a shifting compromise between them. (Hettinger and Throop 1999) For example, in terms of a simplified economic standpoint, development would primarily be measured in terms of growth. The most basic indicator of a nation's successful economic development is gross national product

(GNP). If we take a hypothetical nation's main economic export activity of logging, through GNP statistical analysis, the greater the nation's ability to cut down trees and process them for timber etc., the greater the activity could be considered a productive development in terms of growth - even though from an environmental aspect such deforestation would be considered highly unsustainable (Pearce 1986).

The agricultural process highlights issues of such aforementioned competing SD interests. The designation of specific sites for natural food production might be considered a sustainable move by a society. However, the continuous process itself challenges the concept of SD from an ecological standpoint. Bartelmus (1986) highlights that:

> "In young systems the rate of gross production of biomass and organic matter tends to exceed the rate of community respiration, that is the maintenance costs of the ecosystem. Mature systems on the other hand exhibit equal or near-equal rates of production and respiration."

Ecological resilience emphasises that ecosystems undergo continuous change. It focuses on a specific ecosystem's capacity to absorb particular 'shocks' whilst maintaining its ability to function through natural stages of renewal or reorganization. Ecological resilience theorists view these naturally occurring strategic stages as 'key to sustainable development' (Folke 2002). The anthropocentric interests of crop production may require the maintenance of an ecosystem in a continuous 'young' state, which therefore sacrifices SD from an ecological perspective in order to maximise production. Preventing an ecosystem's development through its resilience-dependent stages, in which it achieves its maximum capacity to adjust to potential evolutionary threats (such as rise in annual temperatures or a natural migration of a particular species), prevents it from attaining an adequate level of natural stability.

This form of anthropocentric control is illustrated within the findings of the State of Nature (SNR) report (2016), which monitors quantitative trends for almost 4,000 terrestrial and freshwater species in the UK. The SNR highlights that the UK's woodland systems have changed to vast extent, predominantly due to anthropocentric influences (SNR 2016, p.27). Historically the UK was mainly covered by large woodland and heathland areas but has reduced to a woodland area percentage of only 13 per cent. At least 80 per cent of this is under 100 years old and only a minute 1.2 per cent is classified as semi-natural ancient woodland. This makes the UK one of Europe's least wooded nations today.

Between 1970 – 2013 (long term) 53 per cent of woodland species declined, whilst between 2002 and 2013 (short term) 51 per cent of numbers of woodland species also declined (SNR 2016, p.29). Furthermore, the index of change in the abundance and occupancy of woodland species has declined by 24 per cent over the long term and by 7 per cent over the short term. Meanwhile, the UK woodland bird indicator has declined by 20 per cent since 1970 and the England woodland butterfly indicator by 51 per cent since 1991. Damningly, 11 per cent of woodland species in Great Britain are threatened with extinction.

Over the last century, the percentage of woodland areas has more than doubled due to vast new planting of trees. However, the majority of these newly planted trees are identified as non-native coniferous trees that can be well utilised within the timber industry but from an ecological perspective, provide fewer benefits for native wildlife (UK National Ecosystem Assessment 2011). Thus, despite the supplying of a much-

needed increase in woodland percentile, the economic benefit of increased timber production is to the detriment of stabilizing past levels of biodiversity, i.e. economical facets are given precedence over environmental facets.

As discussed above, economic development is considered to be one of the main features in Brundtland's effective SD concept. However, arguably, under this sub-component, SD is increasingly sacrificing environmental interests for the sake of increasing economic gains. Concentration on 'growth' has led to an ever-widening financial divide both internationally and nationally, demonstrating that Brundtland's emphasis on the need for greater equitable distribution (World Commission on Environment and Development 1987, p.43) has been ignored. From an international perspective, supplying goods and finance in attempts to reduce the stress of hunger and poverty amongst 'developing' nations, can lead to increases of dependency on richer nations. This removes the opportunity for the recipient country to develop and maintain a level of sustainable independence (Redclift 1989, p.61). Also, the provision of cheap imports helps to strengthen the urban workers and elites at the expense of rural groups (Lipton 1976), whilst the exploitation of poorly-balanced trade agreements can lead to a greater need for the developing nation to produce agricultural commodities for export. This in turn results in an increase in land use to generate said product, causing local farmers to become increasingly dependent on exportation goods rather than increasing levels of sustainability from within (Institute for Sustainability Leadership 2014, p57). Simultaneously the expansion of sites for large scale agricultural farms are likely to lead to deforestation and sacrifice of natural ecosystems such as that in South America, with Brazil, Bolivia and Columbia all being prime examples.

From a national perspective, the UK is still attempting to balance itself in the wake of the 2016 referendum, in which the majority voted for the UK to leave the European Union. The current Prime Minister Theresa May has publicly expressed that should this happen, removing the UK from the existing single market, which currently allows free movement of goods, services, capital and potential employees. Statistics show that in November 2016 the UK's total trade balance for goods and services within the EU single market was 4.2 billion GBP in favour of importation (UK trade: December 2016, 2018). It is argued that should the UK lose that ability for free movement, the extra costs of importing and exporting goods and services will mainly impact smaller companies and partnerships who cannot afford sudden increases of expenditure. Conversely the protectionist measures brought on by the triggering of Article 50 (European Parliament Research Service 2016) by the UK government through levied importation costs, could lead the UK to focus on local commodity purchase, increasing support for local farmers and communities. However, the longer detrimental effects for a developed nation (as opposed to one considered to be still developing) (Nenovsky and Torre, 2015) adopting such measures could well eclipse the short-term gains through rapidly increased consumption of British produce, limiting the individual farm's ability to grow sustainably.

Research studies conducted by Hansen et al. (2004) on farmers' perceptions of risk on shaping their individual concerns and motivations for specific action could help to explain how such interests become limited to individual facets of sustainability, creating competition through individual interpretation of national policy measures. Their research identified the existence of a "finite pool of worry", suggesting that individuals had a finite resource of worry for the risks to specific concerns (Hansen et al. 2004, p.2). They found that when concern about one type of risk would increase, worry about other

risks would frequently decrease. When responding to uncertain and risky situations, humans tend to focus and simplify their decision making. Individuals responding to a threat are likely to rely on a single, immediate action, even when it provides only limited protection or risk reduction in the relative short term and not very effective outcome solution for the long term. People often take no further action, presumably because the first one succeeded in reducing their sense of worry or risk as they feel that they are adequately contributing as an individual in mitigating the effects of climate change. This process is labelled the 'single action bias' (Weber et al. 1997). This could therefore help to explain why such competition of interests continue to exist amongst the search for a more holistic approach of SD. As single action bias influences the choice of the individual's one remedial contribution attempt, the person is more likely to select the outcome which reduces the greatest risk/maximize benefits for them personally, as opposed to the outcome that benefits the greater collective.

2.6 Paradigm Shift/Adjustment Rationale to Improve A More Holistic Application of Sustainable Development

Increasing numbers of academics have voiced caution for continuing to rely on Brundtland's definition as the foundation on which to build policies. A significant criticism is that the Brundtland Commission's definition – "...meeting the needs of the present without compromising the ability of future generations to meet their needs" - focuses too strongly on preservation for future generations' requirements under the intergenerational principle, whilst ignoring other key principles of equity under the intragenerational principle. These include geographical equity, procedural equity, and

inter-species equity (Ndah 2015). There is increasing academic emphasis on SD policies being required to support ecological, social and economic benefits based on ecosystems, as well as other equity principles which cover social justice;

> "Integrated approaches are needed to foster sustainable development — that is, an equitable advancement of human well-being that does not compromise ecosystem integrity" (Fischer et al. 2015, p144).

Steps are being taken to improve the application of the concept of SD (Fischer et al. 2015, p.10; Trudeau 2018) simultaneously; academic argument highlights the importance of such social justice principles existing from a bottom-up perspective in order to better provide equitable distribution (Forman 2017).

Sociologist Max Weber identified that the interests of the people of a society will ultimately vary to an extent, due to individuals or groups holding specific sets of norms and values. In his work Weber (1978, p24-25) highlighted that an individual's rationality of their wants, actions and beliefs involve two independent kinds of reasoning. The first kind is acting as a means for satisfying personal practical needs;

> "determined by expectations as to the behaviour of objects in the environment and of other human beings; these expectations are used as "conditions" or "means" for the attainment of the actor's own rationally pursued and calculated ends."

Weber labelled this as 'Zweckrational' i.e. 'instrumental rational'. The other kind is acting in a manner which conforms to impersonal social rules, void of personal gains:

> "...that is, determined by a conscious belief in the value for its own sake of some ethical, aesthetic, religious, or other form of behaviour, independently of its prospects of success...".

He labelled this as 'Wertrational' i.e. 'value rational'.

Philosopher John Rawls adopts Weber's instrumental and value rationality theory, re-branding the instrumental rationality 'the rational,' and the value rationality 'the reasonable'. Rawls (2001) identifies that, to adequately reflect all variations of a single

society’s norms and values under both sets of reasoning capacities through new legislation and policies, each must be subjected to the theme of 'justice'. This effectively manages society's "irreconcilable differences in citizens' reasonable comprehensive religious and philosophical conceptions of the world” (Rawls 2001). He states;

> “Justice is the first virtue of institutions, as truth is of systems of thought. ... laws and institutions no matter how efficient and well-arranged must be reformed or abolished if they are unjust. Each person possesses an inviolability founded on justice that even the welfare of society as a whole cannot override... Being first virtues of human activities, truth and justice are uncompromising.” (Rawls, 2005. P3-4)

2.7 Summary

This chapter has discussed the evolution of SD theory, and highlighted a non-exhaustive set of contemporary problems facing policy makers and planners when attempting to transfer the concept of SD into practice. Applying an overarching sense of 'justice' to the criticism of competing interests in Brundtland's definition of SD, can be used to bridge each of the variables of the definition. This operates close to the already existing underlying concept of equity, as mentioned above. Firstly, avoiding any attempt to define a specific means of measurement, it can act as the basis for a singular overarching framework. This permits application of an improved theoretical definition of what is to be deemed sustainable in contemporary development. Rawles highlighted ‘equal liberty’ as one of the main determining factors of justice. Applying this to Brundtland's facets of SD, it would suggest that should any one facet be superseded by an/others, then in the interests of equality, that specific development could not be considered truly sustainable.

Secondly, as highlighted above, recent academic argument and technological advancement during the 21st century has postulated the direct relation of specific principles of justice to the original three characteristics of SD. In particular, this research seeks to focus on those particular principles of 'environmental justice', 'ecological justice' and 'energy justice' and how important these are in effectively administering SD throughout the UK.

The argument then becomes a question of how to process these forms of justice into contemporary forms of SD. As Patricia Birnie, Alan Boyle, and Catherine Redgwell (2009, p121) identify "The essential point is that [hu]man kind has a responsibility for the future, and that...is incontrovertible...The question then becomes one of implementation". In the following chapters this thesis will provide academic evidence supporting the introduction of each of these three specific, new components into sustainable thinking, via a conscious paradigm shift - or more specifically a paradigm adjustment - that will continue to encompass Brundtland's existing SD definition.

Whilst this research shares the academic viewpoint that Brundtland's "straightforward elements of the original formulation remain sufficient, valid and instructive" (Gaines 2014, p9), this thesis argues that, by expressly applying each of these three sub-forms of justice into the assessment of a NSIP/group of NSIPs' sustainability, a better and a more well-rounded measurement of SD can be achieved. This can then be implemented within a framework which specifically supports the greater uptake in offshore wind energy projects within the UK.

Chapter 3 - The Ecological Justice Paradigm

3.1 Introduction

This chapter will give a brief overview of the ecological justice theory, discussing its historical origins, together with the theoretical and legislative developments surrounding it. The chapter will then highlight the importance of ecological justice in the development process and analyse the increasing conflicts between socio-economic growth and ecological conservation. This will demonstrate the need for an increased level of recognition and support for ecological rights. This thesis will then use the work of Iris Young to demonstrate how such recognition may be increased, by comparing and expanding Young's enabling measures of oppression from an anthropic-societal aspect into a wider holistic ecological society. This research will then critically analyse how existing measures are protecting the rights of non-human species in the UK, through Environmental Impact Assessments.

3.2 An Overview of Ecological Justice

The principle of environmental justice is a vital concept within contemporary SD theory. However, environmental justice literature demonstrates the difficulties in balancing anthropocentric viewpoints associated with social justice - societal fairness and human rights based on the equal distribution of environmental disadvantages and benefits - with the protection of biodiversity (Evans and Phelan 2016; Kubanza et al. 2016; Rodríguez-Labajos and Özkaynak 2017).

Recent academic discourse suggests that such difficulties have created an unintentional conflict; whether the preservation of basic human rights supersedes the goal of biodiversity preservation (Brechin et al. 2002, p45). Ecological justice theory refutes the idea of a hierarchical division between humans and nature, with the environment's main role as that of supporting humans with services (Sachs and Peterson 1996). It is vital in refocusing societal interests on the protection and enhancement of global biodiversity (Shoreman-Ouimet and Kopnina 2015).

Ecological justice - like its environmental counterpart - originates from the concept of social justice. However, it differs by having a nature-focussed set of values, with underlying rationales based on environmental ethics which are rooted in ecocentrism. Such values are partly designed to remove the limitations of focusing purely on the anthropocentric stance of environmental justice. It extends the equitable distribution of justice beyond the boundaries of human lives to all forms of nature, from an intergenerational perspective (Yang 2006).

3.2.1 The Development of Legislative Support for Ecological Justice

Coinciding with the enlargement of the European Union, increasing economic competition across European marine territories necessitated the introduction of overarching regulations. These were introduced in the 1970s to manage sea-based activities. The 1972 Oslo Convention (otherwise known as the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft) was one of the first pieces of legislation to do this. The Convention's main aim was to reduce the non-permitted dumping of pollutants which would otherwise be considered harmful to

human health, into the marine territories of signatory parties, or by vessels under a signatory's jurisdiction. The 1974 Paris Convention followed, with the aim of combatting human-caused pollution of marine environments originating from land-based sources (Paris Convention 1974). However, as demonstrated by these and other forms of international legislation and policies, the concept of environmental justice was founded on a bias towards anthropocentric interests. The Oslo Convention highlighted this failure fifteen years prior to the Brundtland report.

Following the Brundtland Commission's report, measures for the more responsible management of natural marine systems were introduced through a range of legislative measures. These placed obligations on Member States to protect biodiversity and the natural environment. One of the first major forms of defined agreement between EU member states requiring the need for greater level of protection for non-human entities, was implemented in 1992. This was the Convention for the Protection of the Marine Environment of the North-East Atlantic, otherwise known as the OSPAR Convention (1992), Coming into force on 25 March 1998, the OSPAR Convention combined both the1972 Oslo Convention and the 1974 Paris Convention.

The OSPAR Convention expressly directed member parties to recognise the "vital importance" of marine based flora and fauna within North-East Atlantic territorial waters. It also promoted the elimination of marine pollution in order to:

> "achieve sustainable management of the maritime area, that is, the management of human activities in such a manner that the marine ecosystem will continue to sustain the legitimate uses of the sea and will continue to meet the needs of present and future generations" (OSPAR Convention 1992, p.5).

This was a historic and effective recognition of the need for a standard level of protection for all marine ecosystems throughout northern Europe. However, there was a

delay in response from EU member state governments and the Brundtland Report highlights this as a particular problem.

The five-year response to *Our Common Future* underlined a lack of immediate commitment to act on climate change prevention and the protection of biodiversity. Whilst numerous national governments have demonstrated signs of good faith by signing up to voluntary action plans such as the Agenda 21, these are non-binding. As a result, signatories will avoid any legal/financial ramifications if they fail to meet the Agenda's commitments.

The conflict between economic gain and ecological protection, and a lack of effective deterrence for breaching such measures, can create conscious non-compliance amongst maritime industries. One example of this is the European Common Fisheries Policy (CFP). This initial attempt to better manage maritime sustainability was commendable. However as reported by the European Commission, non-compliance with the Code for Responsible Fisheries (Food and Agriculture Organization (FAO)1995) had culminated in dangerously unsustainable practices which threatened European marine biodiversity. This was attributed to the increasing competing economic and environmental interests of European fishing fleets.

Recently, more coherent attempts were made to design a framework which suited the various competing interests. Adopting what is now known as the 'Ecosystem Approach', the cumulative aim was to reach a balance between the conservation of biodiversity, its sustainable use, and equitable sharing of benefits arising from the utilisation of natural resources. Adopting this increased coordination between the varying levels of

government throughout the EU – national, regional and local authorities along with national and international maritime authorities - promoted improved sustainable development across different policy areas. In this way, the improved management of competing interests began.

The introduction of the Integrated Maritime Policy (IMP) (2007) represented another example of policy design which attempted to improve coherence, by encompassing various environmental issues under a single overarching policy. Endorsed by the European Council on 14 December 2007, its main objectives included the promotion of 'blue growth' through marine spatial planning, whilst upholding conservation protection from the impacts of human activities. In this way, the aim was to deliver the highest quality of life in coastal regions and to maximise the sustainable use of oceans and seas. Improved protection of marine biodiversity was required in respect of the continuing depletion of the fish population and this was given by the implementation of the EU Marine Strategy Framework Directive (MSFD) in 2008. The key objective of the MSFD is to achieve 'good environmental status' throughout European seas by 2020. The preamble to the Directive stated that EU maritime policy required an environmental principle which would deliver the appropriate protection:

> "The marine environment is a precious heritage that must be protected, preserved and, where practicable, restored with the ultimate aim of maintaining biodiversity and providing diverse and dynamic oceans and seas which are clean, healthy and productive. In that respect, this Directive should, inter alia, promote the integration of environmental considerations into all relevant policy areas and deliver the environmental pillar of the future maritime policy for the European Union," (EU Marine Strategy Framework Directive 2008, p.164/19).

When compared to the IMP, the MSFD has much greater power than the soft-law policies such as OSPAR, as each signatory member is formally required to transit the MSFD into their local legislation by way of a legally binding action plan.

The MSFD became the main overarching framework for several key pieces of legislation at European and UK levels, concerning the direct protection of non-human entities. This led to a number of examples of legislation which had the objective of contributing towards the achievement of SD in response to the effects of climate change. Key examples of legislation containing such broad duties on public authorities include: Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive); Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive); Directive 2000/60/EC establishing a framework for Community action in the field of water policy (Water Framework Directive); the Common Fisheries Policy; Section 36 of the Climate Change Act 2008 (CCA) and the Natural Environment and Rural Communities Act 2006.

The Habitats Directive and Birds Directive in particular have facilitated significant levels of co-operative conservation activity across the European Union. The Birds Directive promotes better understanding of conservation needs, including increased understanding of the specific migration timings and breeding patterns of individual species listed under Article II of the Directive. In addition, it provides guidance on management plans for huntable bird species with endangered status (Koschová et al 2018). The Habitats Directive promotes high standards for Member states' protection and maintenance of biodiversity, whilst requiring them to take account of economic, social and cultural requirements while doing so, together with regional and local characteristics. Under these requirements, Member States are obliged to maintain or restore those natural habitats and wild species which have specified importance as listed in the Directive's Annexes.

The Birds and Habitats Directives were transposed into UK law by the Conservation of Habitats and Species Regulations 2010 (The Habitats Regulations), which consolidated all amendments made to The Conservation (Natural Habitats, &c.) Regulations 1994. The Habitats Regulations also contain new provision for implementing aspects of the Marine and Coastal Access Act 2009, such as enabling Marine Enforcement Officers to use powers under the Marine Act to prosecute certain offences involving nature conservation and sea fisheries.

3.2.2 The Need for Greater Support of Ecological Justice

Despite this progress in improving ecological considerations within planning development, there still exists a broad consensus that stricter ecological conservation should be recognised within the remit of SD. Such consensus perceives a shortfall in the provision of adequate protection for biodiversity. This is seen as resulting from a lack of coordination and application between development and environmental protection in major infrastructure projects, by the key legislative functions. This has led to calls for the introduction of more effective conservation legislation within SD (Cook 2011).

Some critics of the ecocentric perspective still remain, emphasising that any conservation efforts should only be based upon a humanistic altruism form of conservation; that if humans do not directly benefit from the species in question, then the species is to be seen as having little or no value and therefore conservation protection should not be afforded to it (Kopnina 2013). Similar attitudes adopting such altruistic methods towards nature conservation are demonstrated by the Payments for

Ecosystem Services schemes (PES), which has gained wide acceptance amongst conservationists in recent years (Cook et al. 2016; DEFRA 2013).

This concept of PES demonstrates a conflict between the economic and environmental aspects of SD. By allowing the rights and characteristics of nature to be bought and sold, the importance of conservation is transformed into a value which can be more readily understood, especially by large commercial entities and developed nations; money. However, this approach arguably obscures the overall value of nature by undermining it for the sake of short-term economic gain (Chan et al. 2017).

Radford and Adams (2009) demonstrate some of the ways in which PES transactions can go wrong, beginning with the question of price. They identify that some services are difficult or impossible to financially appraise, such as the fertilizing effect of atmospheric dust from the African Sahel carried across the Atlantic. Also with existing markets susceptible to change, the value of services from different ecosystems may not accurately reflect their diversity, but instead narrowly reflect their desirability to human consumers.

> "There is a serious potential mismatch between the scales at which services are provided and the institutions available to realize those values." (Radford and Adams 2009, p.786)

Furthermore, there is the potential argument that PES creates additional conflict by inadvertently undermining equitable distribution within a society; the commoditization of nature would only benefit the more affluent members of a society who could afford to enjoy the limited resources, effectively creating a "transfer of power to corporations and the very rich." (Monbiot, The Guardian 2012)

Such a maldistribution of equity can be multiplied when considered in terms of the non-human subjects' viewpoint. Financial restitution for the depletion of a species' environment would be of zero consequence, if the ecosystem's biodiversity were to be affected to the point that recovery would not be achievable in the foreseeable future. This would be true even if some form of short-term remedy were to be offered.

Further academic discussion of the importance of ecological justice is based on its emphasis on the intrinsic value of non-human species, regardless of their commodity value (Dietz et al. 2005). In opposition to the humanistic altruist approach, this line of thinking has been labelled by environmental psychologists as 'biospheric altruism', for its recognition of the inherent rights of all living entities beyond humans.

3.2.3 The Importance of Ecological Justice in Offshore Wind

Evidence of increasing support for biodiversity conservation is gradually being demonstrated by both EU Directives and UK legislation. This is apparent throughout the implementation process of each proposed offshore infrastructure project. The implementation of the Environmental Impact Assessment (EIA) Directive on 27 June 1985 introduced the requirement for environmental assessments to be carried out for certain types of offshore development activities likely to have significant effects on the environment. This applied throughout the European Union and was necessary before any development consent could be given.

There is further evidence of international support for the recognition of the importance of biodiverse marine ecosystems. Across almost 6 per cent of the EU's marine territory,

the creation of Special Protection Areas (SPAs), proposed Sites of Community Importance (pSCIs), Sites of Community Importance (SCIs) and Special Areas of Conservation (SACs) were designated under the Natura 2000 scheme, to protect Europe's most valuable and threatened species and habitats. However, not all Natura 2000 sites are nature reserves from which all human activities would be excluded. Some types of development may be permitted, on the condition that any potential planner/s carefully considers all potential impacts to a specific area within a protected Natura site. Failing to do this as part of a planning application would carry the risk of the application being rejected, wasting valuable time and incurring costs at the expense of the planner/s.

Practical evidence for recognition of the rights of the natural environment can be seen in the failed application for an offshore wind farm, located in the outer-Wash area of the Lincolnshire and Norfolk coastline. This proposed 500 MW offshore wind farm was one of three being developed in the area by Centrica plc, together with Lincs wind farm and Race Bank wind farm. The planning application was refused on the grounds documented by the record of the appropriate assessment undertaken for applications, published by the Department of Energy and Climate Change (DECC) under Section 36 of the Electricity Act 1989 (DECC 2012).

Three years after the application of the Docking Shoal Wind Farm proposal was submitted, it was refused in 2012 due to concerns surrounding native bird mortality, and the potential displacement and disruption of the life cycles of the Sandwich Terns' prey species. The North Norfolk Coast Special Protection Area (SPA) supports the largest, long-standing, breeding population of Sandwich Terns in Great Britain. The DECC

determined that the likely cumulative impact of the Docking Shoal, Race Bank and Dudgeon wind farms on Sandwich Tern mortality, would be unacceptable. Interestingly however, an absolute prohibition of threat to Sandwich Terns was not considered, illustrating an attempted compromise between the increasing need for SD and nature conservation.

The DECC demonstrated this in their report, which followed various surveys and collision risk modelling. They stated:

> "Race Bank and Dudgeon may be consented to their maximum capacity without restriction on their initial build and shall not adversely affect the integrity of the Sandwich Tern population of the North Norfolk Coast SPA either alone or in combination with Sheringham Shoal and Triton Knoll offshore wind farms provided that the Docking Shoal application is refused" (DECC 2012, at p.43).

However an argument can be made that, whilst the modelling results show the predicted best-case annual average Sandwich Tern mortality rate per turbine, for Docking Shoal this would be almost double the rate of the second highest proposed wind farm (0.844 > 0.448) (DECC 2012a; Christie et al., 2014), the risk to Sandwich Tern mortality would still be present regardless of the existence of the Docking Shoal wind farm. From an ecological justice perspective, this planning application judgement demonstrated the continued failure to adequately protect biodiversity. The fundamental rights of the affected non-human species being threatened by the Race Bank and Dudgeon wind farms, were not being taken into consideration equitably (Kopnina 2014).

3.3 Young's 'Justice' for Increasing Awareness of Ecological Justice

The Docking Shoal case demonstrates a lack of awareness of the rights being affected. The concept of mis-recognition arose within an environmental justice concept, particularly in the work of Nancy Fraser. This highlights the mis-recognition of particular marginalised groups, in order to improve the equitable distribution of justice within a society (Fraser 2008; 2014). However, whilst the focal concern of social justice is the standard to which the equal distribution of rights and benefits are made within a society, to solely attempt the transfer of this equitable distributive process to include non-human species would be inadequate to resolve ecological injustices:

> "Distributional issues are crucial to a satisfactory conclusion of justice, [but] it is a mistake to reduce...justice to distribution" (Young 1990, p 15).

Methods for improving the distribution of equitable justices need to "adopt the full range of approaches in exploring distributional inequalities" (McCauley and Heffron 2018, p.4).

Iris Young (1990) discusses the concept of 'justice' in a social context, arguing that for justice to exist within a society one must first remove any potential disabling constraints, specifically identifying two of these as 'oppression' and 'domination'. Young highlights five facets, or 'faces', that function as criteria when determining whether individuals or groups are being oppressed: marginalisation, powerlessness, cultural imperialism, violence and exploitation. (Young 1990, p59)

If we transfer Young's faces of oppression from a strict anthropocentric social focus to the wider ecological justice rationale – recognising flora and fauna as distinct social groups within a society that also includes all the currently recognised human social

groups – it demonstrates that several contemporary forms of oppression are being inflicted on those non-human social groups. This broadened hypothetical society is referred to as an 'eco-society' for the purposes of this research and is discussed below.

3.3.1 Marginalisation

According to Young;

> “Marginalization is unjust because it blocks the opportunity to exercise capacities in socially defined and recognized ways” (Young 1990, p.50).

If we apply the analysis of marginalisation to an eco-society, then the issue is demonstrated through mitigation-driven trans-locations during the development of specific projects.

UK planning and development policy guidance demonstrates that in various scenarios involving protected sites and species, the mitigation of designing or identifying an alternative habitat site for various species, is one plausible option for a planner should the circumstance arise. (Natural England and DEFRA 2017)

The underlying rationale for such mitigation is to:

> "reduce animal mortality caused by human activities (e.g. development), by relocating individuals away from project sites" (Germano et al. 2015, p.100).

However, this allows the planner to marginalise the species in question, reflecting Young's viewpoint of the exclusion of equal citizenship rights within a society. This argues that by removing a particular native species from its natural habitat/s and relocating it to a new unsecured environment, the species is reduced to being an inconvenient hurdle for the project. Through the relocation of a species, its ability to achieve, or progress towards natural maturity within a habitat is removed. This in turn increases the risk of disrupting the species' resilience to adapt within the new habitat/society, which would be vital to its continued survival (Germano et al. 2015).

Young's observations on the injustice of marginalising a social group can be further highlighted within an eco-society. This can be through a lack of adequate measures such as following monitoring procedures, through translocation methods which increase the risk of a species failing to establish or enhance a viable population at the release site. For example, the specific numbers moved may not represent a substantial enough proportion of the source population, or alternately too many may be moved. This might lead to the population at the release site exceeding the ecological carrying capacity of the new habitat, causing increased mortality among the resident population. There is also the risk of disease transmission and social disruption through the inadequate monitoring of a translocation procedure by planners (Germano et al. 2015).

As Young (1990, p.51) highlights, the translocation method provides developers with the

> "warrant to suspend basic rights to privacy, respect, and individual choice", meaning that welfare agents are often left to provide social support for the marginalised: "In meeting the needs of the marginalized, often with aid of social scientific disciplines, welfare agencies also construct the needs themselves" (Ibid).

The operation of these 'agencies' can be seen if social boundaries are broadened to include the wider eco-societal limits. These agencies take the form of NGOs and non-departmental public bodies such as Greenpeace UK, World Wildlife Fund (WWF) UK and the British Ecological Society (BES).

3.3.2 Powerlessness

Regarding the term 'powerlessness', Young (1990, p54) states that it is key to demonstrating the structure of exploitation. The powerless are those who lack the authority to develop, and contribute to, their own self-realisation within a society, whilst being exposed to disrespectful treatment due to their social status. Within anthropocentric society, evidence of this restriction of power and the lack of capacity for development can easily be identified, especially in terms of employment. Workers suffering from a disability are viewed by some as having a limited capacity to develop certain skills which may restrain them in achieving a form of self-realisation within the work place. Women (Adler 2000) and ethnic minorities (Blackaby 2002) also suffer discriminatory restrictions within employment, reducing their ability to achieve their maximum potential via their own contributions. This again demonstrates that withholding the power to develop one's capacities would restrict the achievement of self-realisation within a society.

Young (1990, p54) reflects on how the relations of power and oppression via social division of labour, can shape ones institutional position in relation to others. In a UK eco-society this is reiterated by the humanistic altruism perspective (above), where the value of a particular species is calculated on the basis of its economic utilization by humans (Kopnina 2013). Arguably this perspective would deem those species employed in an agricultural role as holding a higher social value in the society for their contribution, than those species that do not. This applies even more so to those species which may be deemed to negatively impact society, for example by restricting or delaying planning permission for an infrastructure project which could provide a

substantial economical contribution (one example being the impact Great crested newts could have on development plans).

Within the majority of contemporary western cultures, those native creatures and plants which make no positive contribution to a society are forever deemed a burden or vermin, regardless of how important their biodiversity contributions might be. As various aspects of history demonstrate, from an anthropocentric societal perspective, the relocation of a minority group from an area not for their benefit or interest, would be universally considered a breach of basic human rights (Simpson and Yinger 1987).

However, it is not uncommon for allocated licences to remove a species, despite serious potential impacts which would otherwise be prevented under Regulation 41 section (2) and section (3) of the Conservation of Habitats and Species Regulations (2010). Negative impacts may include the ability to achieve their own self-realisation within that group's culture (such as nesting, spawning, breeding etc.) (Dietz, 2005). This situation within a hypothetical eco-society, would demonstrate an analogous unconstitutional interference with individual rights; why should the lawfulness of the interference in an existing paradigm, rely upon which social group is to be affected?

3.3.3 Cultural Imperialism

It is not only possible to identify the exploitation of nature, but the reason why such exploitation has become a societal norm, particularly in western societies. Young applies the theory of cultural imperialism to demonstrate how the universalization of a dominant group's experiences, interpretations, values and perceptions of certain elements of a society (including other groups), lead to the viewpoint of the dominant

group becoming the generalised norm for other groups in that culture (Fraser 1987). Societal traditions are passed from one generation to the next. Since the Industrial Revolution, technological advancements have enabled the ever-increasing exploitation of natural resources for greater economic gain. Whilst there was no scientific evidence at this time to discourage these practices, they became the norm for many industrial and agricultural processes that would subsequently be passed from one generation to the next.

Young (1990, p55) further identifies that the culturally dominated group undergo a 'paradoxical oppression'; the group is marked by the imposition of stereotypical impressions whilst simultaneously being rendered 'invisible'. This in turn works to inferiorise the group, devaluing its worth and contribution to the society. For example, the state of British woodland as highlighted above in the State of Nature Report (2016) shows a gradual transition from native coniferous trees to their replacement by non-native coniferous trees. This supports an industry that produced 11 million tonnes of timber in 2014 whilst bringing fewer benefits to wildlife (NEA 2011). This demonstrates that the main use for British woodland is to supply the timber industry and that this is now an unquestioned societal norm. At the same time, the intrinsic value of naturally-occurring biodiverse woodland species are now being blatantly overlooked by the current generation. As with the humanistic altruism view of native wildlife, should the species provide little or no economic benefit, then consideration of its conservation would be minimal because it does not provide economic benefit to humans.

Few contemporary examples exist where conservation is harmonized with culture and biodiversity. In certain instances, they demonstrate the importance of ecology within societies throughout Europe under the relatively recent theory of 'biocultural diversity'. Maffi (2014) for example demonstrates the definition as:

> "the diversity of life in all its manifestations: biological, cultural, and linguistic — which are interrelated (and possibly coevolved) within a complex socio-ecological adaptive system.".

This includes all biological, cultural and abiotic diversities, and the interactions between them (Loh and Harmon 2005). The 'Delos Initiative' is one international example, which aims to:

> "identify the pertinence of and meaning of sacred natural sites found in the developed world, and to investigate whether and how spiritual values can contribute to the conservation and wise use of significant natural areas" throughout Europe, North America, Japan, Australia and New Zealand (Task Force on Cultural and Spiritual Values of Protected Areas (CSVPA)).

An example within the UK is the work of Natural England and Natural Resources Wales (n.d.) in their conservation of terrestrial, coastal and marine flora, fauna and heritage features along coastlines on England and Wales (Natural England, 2015).

3.3.4 Violence

Many individual groups in the UK are subjected to violent crimes because of their social group. For example, Rape Crisis for England and Wales stated that of the171,000 helpline contacts made within 12 months to 31st March 2016, 95 percent of the service users were female (Rape Crisis England and Wales, 2017). Other national statistics show that the percentage of hate crimes have risen significantly across the board in the past five years. The number of such offences which were racially (15 per cent) or

religiously (34 per cent) aggravated, increased during 2014/15 to 2015/16. At the same time, other violent offences based on motivating factors such as a victim's disability or transgender associations, show marked increases of 44 per cent and 41 per cent between 2014/15 to 2015/16 within the UK (Corcoran et al. 2016).

Whilst wide ranging legislation exists in the UK covering violent crimes upon humans, the same cannot be said for violence enacted towards non-human entities. Only from 2005 was it deemed illegal to deliberately cause the death of wild animals through violent means. The introduction of the Hunting Act 2004 held that the hunting of wild mammals (such as foxes, deer and hares) with dogs throughout England and Wales, was illegal. Despite the Act's introduction, several exemptions continue to provide for the violent deaths of such wild animals. Schedule 1 of the Act permits the use of dogs in the process of flushing out an unidentified wild mammal for said mammal to then be shot, whilst the use of dogs to hunt rats and rabbits continues to be exempt from the Act, as long as permission of the landowner is granted. (Schedule ,1 S.3(a)(b) and S.4(a)(b) Hunting Act 2004.

Regarding offshore wind farms, there is minimal risk from instances of violence in the same way as those described above. However, there is the rare risk of violent death (notably for birds and bats) through collisions with operating turbines, should appropriate measures not be considered during the planning stage (Furness et al. 2013), as discussed below. Also, should such collisions occur, the lack of proof of intent under the Wildlife and Countryside Act, would diminish the legal accountability of the developer.

3.3.5 Exploitation

Exploitation in contemporary societies remains a very real form of oppression and is the easiest to identify, especially in SD. Rhetoric using the oxymoronic term of 'sustainable exploitation' is common (Hilborn, 1995, Gallego et al. 2016). This contentious concept is used throughout the language of EU and UK policy, most notably in regulations governing the Common Fisheries Policy (CFP). In this situation, the term refers to the exploitation of fish stock in such a way that it does not have a significant negative impact on marine ecosystems. The aim of this is to ensure that future generations can enjoy a similar level of opportunity to exploit marine stock for maximum profit. Sustainable exploitation continues to be expressly referred to in the most recent EU Regulation for the CFP (Regulation 2015). This raises clear concerns regarding the negative effects of discarding excess or unintended catches of marine species, as this could impact the intended sustainable exploitation of marine organisms and marine ecosystems (ss11 Regulation 2015).

Furthermore, recent court decisions suggest that some instruments of the CFP potentially conflict with legally binding obligations of ecological protection under Article 4 of the Birds Directive and Article 6 of the Habitats Directive respectively. Under these, Member States are required to establish and protect special areas of conservation (SAC) and special protection areas (SPA), which in turn contribute to the Natura 2000 Network. As demonstrated by the European Court of Justice decision in the case C-127/02 (2004) (more commonly known as 'the Waddenzee Case'), certain fishing methods permitted under the CFP within such Natura 2000 protected areas are constituted as 'plans' or 'projects' in relation to Article 6(3) Habitats Directive, and

could have significant effects on the site concerned. Therefore such a plan or project is required to first undertake an effective Environmental Impact Assessment (EIA). The Waddenzee Case demonstrated clear support for ecological justice by highlighting the failure of the CFP to prevent the exploitation of fisheries, through a lack of transparency of its regulations and insufficient control and enforcement of its provisions (Khalilian et al. 2010, p.1182).

Academics have provided broad definitions, with the consensus being that exploitation exists as a distributive model, in which the wealth and reward from one social group's actions are unequally distributed amongst other social groups within that society. John Roemer demonstrates this by arguing that an individual is exploited when the amount of labour embodied in *any* bundle of goods he could receive, in a feasible distribution of society's net product, is less than the labour expended. Alan Schnaiberg (1980) describes how modern industrial society continues to exploit the environment due to an inherent need for economic systems to continually yield profit, under what he labels the *treadmill of production*. By creating consumer demand for new products, the result is often expansion of the ecosystem until it exceeds its physical limits for growth or its carrying capacity (Hannigan, 2014).

Thankfully the level of exploitation is minimized with offshore wind projects, as the element used to provide profit, is wind. However, as with developers intending to exploit the UK's prevailing winds to maximise profit, migrating bird species also exploit seasonal prevailing winds. By optimising wind speed (V_a) whilst correlating it with its 'minimal power speed' (V_{mp}) output to achieve minimal fuel use, bird species use the tailwinds during their migration in order to achieve maximum range (Newton, 2007).

However, these competing interests in wind exploitation could lead to conflict at sites, which in turn might result in an increase in bird mortality rates through collisions with operating turbines. Thus, project placement should be carefully considered in order to reduce instances of micro-avoidance (when birds enter the wind farm but take evasive action to avoid individual turbines (Band, 2011; Cook et al. 2012) and macro-avoidance (when birds alter their flight path to keep clear of the whole wind farm (Desholm and Kahlert, 2005)).

The potential for other forms of ecocentric exploitation could still exist, and so the planning and construction of offshore projects should give adequate consideration to any potential oppressive impact upon the rights of nature. Furthermore, construction of offshore wind farms could be designed to provide positive means of support for the conservation and protection of biodiversity, during their time in operation and beyond. Thus, it is vital that both potential positive and negative impacts of offshore wind farms should be assessed at the earliest opportunity.

3.4 Ecological Protection Through Development

Within academic discourse there exists the premise that energy modernisation should overcome environmental crisis without limiting development. Ecological Modernization theory suggests that the process of ‘superindustrialization’ (Huber, 1982; 1985) can provide improved ecological protection through an ecological switchover using new, sophisticated clean technologies within industrial society by restructuring development processes (Spaargaren and Mol, 1992).

The main assessment method currently used to provide ecological protection during proposals of NSIPs (as demonstrated by the Waddenzee case), is the undertaking of Environmental Impact Assessments (EIAs). The initial assessment of a specific marine renewable energy project is to be undertaken within member states in accordance with EIA Directive (85/337/EEC), brought into effect within the UK through The Marine Works (Environmental Impact Assessment) Regulations 2007. In addition, the specific ornithological impacts must be considered via the Birds Directive (2009/147/EC) and also through the Habitats Directive (92/43/EEC).

An EIA provides a number of important measures in order to achieve a better overall measurement of a project's impact on the surrounding environment, such as: the collection and analysis of baseline data; exploring both positive and negative impacts and opportunities for enhancing the environment; analysis of alternatives; and allowing various parties such as government officials, industry project managers and citizens to participate in critiquing the project in question.

However, despite EIAs positively influencing NSIP planning, coupled with the potential for greater numbers of offshore wind farms to aid conservation, this unprecedented industrialization of the UK's marine environment is accompanied by the potential for negative impacts. One of these is uncertainty regarding the cumulative impacts of the growing numbers of renewable offshore projects. Potential identifiable impacts may be easily enough understood and mitigated in regard to a single or minimal number of projects, as a result of previous research. However, with the steady increase of projects in UK coastal waters, the cumulative impact on coastal marine life is unknown.

In addition, current research suggests that there are further knowledge gaps. These concern the potential long-term impacts on marine species following the construction and activation of offshore farms. For example, there is a growing knowledge base for understanding the impacts of anthropogenic noise on population levels of marine mammals, (such as pile driving causing population displacement and behavioural change (Teilmann and Carstensen, 2012)). However, there is little research into, or monitoring of, the long-term effects of such constructions on marine populations (Duinker and Greig, 2007). Similar knowledge gaps surrounding the ecological impacts of offshore wind farms are reflected in a lack of research into the micro/macro-avoidance patterns by migrating birds (above). An increased level of research would improve the reliability of prediction models and thus provide greater certainty in final EIA reports (Chamberlain et al. 2006).

Further problems within the EIA process itself, have the potential to cause detrimental effects to marine wildlife. Ambiguous language contained within the EIA Directive creates a double-edged sword with regards to offshore wind farm applications. The main example is where the Directive, as amended, refers at various points for the assessment to report on 'significant diverse effects' of a proposed project on the environment.

The term 'significant' effect lacks a clear definition, which creates difficulty for the proposing planner in understanding what the environmental assessment should specifically detail. This ambiguity surrounding significance also creates problems for the decision maker during the application process, as the lack of a clear definition for the term, results in there being is no impact standard on which to base the planning

decision. This problem is increased by the complexity of the planner's need to consider varying aspects of sustainable development (Ascough et al. 2008).

Additionally, there is a divide between those concerned with biodiversity conservation and those who are focussed on protection of 'landscapes' (Harmon, 2007). This causes a lack of coherence in conservation, further complicating developers' understanding of the specific criteria to be considered within EIA applications. This is especially true when the criteria in question may vary in different locations throughout the UK. Not only may this create differing threshold standards of what constitutes a significant diverse impact, but it may also result in a misjudged EIA. This could prove very costly, from both economic and time perspectives.

3.5 Summary

The recognition of the EIAs current effectiveness and importance for conservation, is clear. Young's five faces of oppression highlight continued injustices which are being perpetuated within development strategies, when attempting to balance socio-economic growth and ecological protection. There is an evident need for a clearer form of interdisciplinary scrutiny within NSIPs, to mediate between the growing divergence of the anthropocentric versus ecocentric interests within SD (Wilshusen et al. 2002).

As illustrated by the remarks of *Conservation Biology* editors, the anthropocentric focus in conservation needs to be extinguished and replaced by a conscious rapprochement of scientific disciplines that distributes benefits equally:

> "The most repetitive message coming out [of these retrospective papers] is the great need for interdisciplinarity and inclusion of various social sciences. This is an obvious imperative; we have to learn how to transform our scientific knowledge into practice. We are facing a fundamental problem relative to human behaviour, and the solution will ultimately need to take human behaviour into account... Those who still think biology and ecology alone are sufficient for our task – that good science by itself will save the day – are as much in denial as those who say there is no environmental crisis." (Meffe et al. 2006, p595-596).

Equally, the adoption of the ecological enlightenment and sustainability narrative could help to adjust the current paradigms, in order to favour more ecologically friendly practices which may then return benefit to human societies (Catton Jr and Dunlap, 1978). This could be achieved through improving general societal recognition of not only the value of nature, but the ways in which injustices are being created.

A more holistic approach to conservation would aid in providing a better understanding of the ecological impacts, both individually and cumulatively. It would not only contribute to an improved model for the assessment of SD in offshore wind farms, but also to enhanced impact assessments. If ecologically friendly development practices were to be favoured, with additional support for biodiversity improvement methods e.g. fish Aggregating Devices (FADS), then anthropocentric benefits beyond aesthetic enjoyment, i.e. economic benefit, could be realised.

Chapter 4 - The Environmental and Energy Justice Paradigm

4.1 Introduction

This chapter will explore the ways in which contemporary environmental justice theory is being used in the United Kingdom to increase sustainability. In critiquing the current application of environmental justice theory within the UK's sustainable development policy, the chapter will also focus on the ways in which tenets of environmental justice theory are present (or absent) within the UK energy sector, as a factor of 'energy justice' theory. After a brief discussion of both environmental and energy justice history to demonstrate its importance in the UK, this research will identify specific situations which are limiting its application in the UK.

4.2 What is Environmental Justice?

Environmental justice is a relatively broad concept originating from political and social movements. It is employed as a theoretical method which attempts to recognise and address the disproportionate distribution of potential and existing environmental harms and benefits within a society. Whilst doing this, it enables improved planning processes to optimise the meaningful participation of all members of that society in decision making (Rechtschaffen, 2003). It combines the principles of social justice and environmental protection, in order to achieve a fairer balance of environmental costs, burdens and benefits across the varying socio-economic communities within a society (Kameri-Mbote and Cullen, 1996, p 2.).

4.3 Why is Environmental Justice Important to Sustainable Development?

Environmental justice and sustainable development are complementary principles. They reflect similar aims and values, whilst both are vital to implementing a holistic framework which tackles climate change (Adger, 2001). Both philosophies are primarily concerned with improving quality of life, including the distribution of costs and benefits of development, both intragenerationally and intergenerationally (Sovacool and Dworkin,2015; Hofrichter, 1993). Environmental justice focuses on improving access to energy sources whilst minimising the effect of waste products (Schlosberg, 1999).

In designing frameworks to achieve these aims, sustainable development has focussed mainly on the role of states and individuals, with less focus on the community. The primary aim of environmental justice is to promote the collective sense of individuals as a community (Schlosberg, 2007). As environmental justice emphasises concerns surrounding the 'side effects' of industrial activity, it helps guide sustainable development down the operational path of quality and not quantity in terms of technological implementation (Torres, 1993). It essentially bridges the focus gap left by policy makers, when trying to improve levels of sustainable development. This demonstrates that using environmental justice within SD frameworks can create a more holistic approach to driving forward effective socio-environmental policies (Agyeman and Evans, 2003).

4.4 Historical Development of Environmental Justice

The concept of ‘environmental justice’ was formed as a by-product of the civil rights movements in the USA during the 1950s. It was originally based on the shared observation that lower classed social groups and residential areas whose majority ethnic population were non-white, would suffer greater levels of environmental pollution caused by outside sources. This was whilst having the lowest levels of access to environmental resources (Bullard, 1999).

Early forms of the theory were notably demonstrated by academic author Rachel Carson, who highlighted the detrimental effects of agricultural pesticide use on both human health and the environment in the US (Carson, 1962). This partly contributed to the eventual creation of the United States Environmental Protection Agency, which drafts and upholds laws designed to prevent such impacts.

Another key demonstration of the improved application of environmental justice theory occurred in 1982 in Warren County, North Carolina, USA. Here, protests were held against the State's decision to dump hazardous waste in the form of contaminated soil in the Shocco Township in Warren County. Approximately 75 per cent of the town's population were African-American and had the lowest per capita income in the whole of the US (Duke University). The protests drew several prominent civil rights leaders to join the local community in standing against the action, which was identified as a form of 'environmental racism', via the disproportionate burden of environmental ills being placed upon ethnic minority groups (Alston, and Bullard, 1990).

Since the Warren County case, further instances of environmental justice theory have become increasingly recognised, with the theoretical framework being applied in other countries. For example, in the UK a similar situation to Warren County occurred in Greengairs in Scotland in 1998 (Dunion, 2003), where protests erupted against the dumping of toxic waste in proposed extensions to existing landfill sites. Both case studies demonstrate similar trademark characteristics of environmental injustices. Not only because both of the affected communities were minorities, but also because the waste products were produced by outside sources who then imported them into the wronged community, which suffered as a consequence (Schlosberg, 2007). In the Warren County case the polluted soil was being relocated from no fewer than 14 other counties, where it had been created by polychlorinated biphenyls (PCBs) having been illegally sprayed onto roadside soil (Bryant, 2003). The Greengairs case also featured the importing of waste products, this time with the waste crossing the border from England - and significantly from Hertfordshire, a wealthy county near London.

In light of the widely accepted 'Polluter-Pays Principle' (PPP) (Gaines, 1991), both of these cases highlight not only the inconsistency of the PPP, but also the ways in which the equitable distribution of environmental burdens can be overridden by financial trade-offs which emphasise the social divide between the ‘haves’ and ‘have nots’ within society. Under the PPP, the legal precedent holds that the polluter creating an environmental harm, is liable to pay compensation and costs to remedy that harm. However, both case outcomes above contradict the PPP and illustrate how environmental responsibility under the principle can be undervalued and traded. One-off payments for the relocation of waste by the original polluters (who were readily identifiable) to the counties in question, may appear to act as compensation to remedy

the harm from the perspective of the original location of the pollutant source. However, such payment fails to satisfactorily remunerate the receiving party for future harm or foreseeable environmental risk, arguably failing to compensate for the transfer of the 'burden' of responsibility and the resulting outcome (Walker, 2009).

Since Warren County, the theoretical focus of environmental justice has broadened from the distribution of pollution, risk and race, to include wide ranging aspects such as the socio-economic profiles of residents (Dobson, 1998). As demonstrated by the Greengairs case, recent studies conducted within the British Isles found that 662 polluting factories across the UK were being sited in areas where the average household income was below £15,000, whilst only five were in areas where the average household income was more than £30,000 Boardman et al. 1999). A similar study conducted by Friends of the Earth compared pollution level data gathered by the UK Environment Agency, with the Government's Index of Multiple Deprivation. It highlighted that 66 per cent of industrial carcinogenic emissions to air, come from factories in the most deprived 10 per cent of wards. It also showed that people in this most deprived 10 per cent, have on average fifteen times as many carcinogenic emissions from factories in their communities, compared with the average of the other 90 per cent of wards (Friends of the Earth, 2002. P. 2). The report concluded by highlighting the ways in which environmental injustice can generate further forms of injustice in other aspects of society for its deprived members, widening the gap of inequality:

> "Overall, environmental problems are concentrated in more deprived areas, exacerbating the problems of social exclusion, ill-health and health inequalities, often directly creating barriers to people's involvement in normal, day-to-day activities." (Friends of the Earth, 2002. P.3)

4.4.1 Who is at Risk Today?

The contemporary focus encapsulates an increased number of justice issues, which have evolved from the initial recognition of intentional environmental injustices, arising from the maldistribution of environmental burdens within the U.S. (Schlosberg, 2007). This includes complex and multi-layered justice dimensions. The detailed Report of the Sustainable Development Research Network (SDRN) emphasised the detrimental effects of these increasing forms of injustices within the UK. It examined the ways in which environmental injustices are affecting members of our society in various forms and how they operate and interact with one another (Lucas et al.2004). The SDRN Report grouped such environmental injustices according to four key themes, classified as 'doorstep' issues: wider service issues' planning issues, infrastructure issues, and multiple environmental deprivations. These were then further divided into 21 specific topics of concern (Lucas et al.2004, p.15). The SDRN's report demonstrated the far reach of contemporary environmental justice. It emphasised the need for fair access to, and distribution of, environmental benefits - such as access to fresh healthy food and access to environmental services and urban spaces - just as much as the equal distribution of benefits (Lucas et al.2004, p.15). However, due to the report's findings on the multiple forms of environmental justice at work within the UK, it concluded that there are limitations to the existing UK policies that aim to reduce environmental injustice, and it emphasised the need to improve their effectiveness (Lucas et al. 2004, p.125).

The report reiterated the need for social justice theory to improve equitable justice throughout core areas of administration, i.e. process, procedure and recognition (Fraser,

1997; Young, 1990). It emphasised how the application of social justice theory must identify and acknowledge society's most vulnerable and provide an improved level of environmental justice to an accepted standard:

> "[environmental justice must] explicitly recognise both the importance of fair treatment for deprived and excluded communities and the principals of access to information, legal redress and participation in decision-making for those communities" (Lucas et al.2004, p.24).

The rationale behind this approach is that a single vulnerable group can be subject to various compounded forms of environmental injustices at any one time, as a result of a number of access constraints. One example of an access constraint exists in the form of affordability. This is one of the most influential forms of constraint within the UK today, causing various groups to suffer injustice. From an environmental justice perspective, examples of affordability constraints to multiple sub-groups are evident amongst the poor elderly, where it restricts access to facilities including adequate sources of fuel, fresh and healthy food, local transport and urban green space (Lucas et al. 2004, p. 9). Today in the UK, the visibility of this issue has improved the recognition of relatively overlooked forms of environmental (in)justice, such as fuel poverty (Walker and Day, 2012).

4.5 Fuel Poverty

Fuel poverty has become an increasing threat, which can compound environmental injustices in households. Changing climate temperatures and increasing fuel prices are pushing more households into the 'fuel poor' classification and having a knock-on effect on human health. This is especially true of those viewed as vulnerable to other environmental injustices. For example, there is strong evidence highlighting the ways in

which the inequitable distribution of air quality in the UK, is causing those identified as vulnerable to suffer a greater risk to their health (walker et al. 2003). Further evidence also identifies that where a vulnerable household including at least one child is inadequately heated, its residents are more than twice as likely to suffer respiratory disease (DEFRA 2008).

According to the current definition stemming from a revision of the Energy Performance of Buildings Directive 2002/91/EC (EPBD), EU households spending more than 10 per cent of their income on energy are identifiable as 'fuel poor', whilst having difficulties heating their homes adequately. The fuel poverty threshold ratio is calculated by dividing a household's fuel costs (usage multiplied by price) by income, and if the ratio is greater than 0.1, the household is then considered to be fuel poor (DECC 2009). The adequate standard of warmth is generally defined to be 21°C in the living room and 18°C in other occupied rooms (Liddell et al. 2012). This form of environmental injustice underlines an increasing awareness of another doctrine of justice; that of energy justice.

Both forms of justice are intrinsically linked through the flawed existing energy infrastructures, in that they benefit some to the exclusion of others. Whilst both forms of justice represent independent specific forms of justice, thanks to their respective evolutions from social justice, they now carry the same distributional, recognition and procedural problems which are hindering the progress of sustainable development in the UK.

However, this thesis will argue that not only are the flaws in energy justice and environmental justice interlinked, but energy justice can be utilised as a unifying agenda for overcoming sustainability issues related to energy security, fuel poverty and climate change (McCauley, 2017).

4.5.1 What is Energy Justice?

As discussed above, energy justice has its roots in environmental justice (Schlosberg, 2003; 2009). Contemporary environmental justice is directed in several directions, collected under the overarching principle of the

> "fair treatment and meaningful involvement of all people regardless of race, colour, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies" (Bullard, 2005, p.322-356).

Energy justice differs in having a more focused single overarching principle:

> "to provide all individuals, across all areas, with a safe, affordable and sustainable energy" (McCauley et al. 2013, p.108).

Energy justice therefore aims to provide a nuanced understanding of social justice concerns within energy systems, from production to consumption (Ibid).

4.5.2 Why is Energy Justice so Important to Sustainability?

Where sustainable development is concerned with supporting stable economic growth and general social equity without compromising current standards of environmental protection, energy justice emphasises the equitable distribution of energy developed

under the name of sustainable development amongst all citizens, nationally and internationally (Sovacool 2013, p.12). Unlike environmental justice, which is predominantly concerned with the equitable distribution of burdens and threats of development within a society, energy justice aims to actively seek the equitable distribution of the benefits of safe, sustainable energy through energy policy (Jenkins et al. 2016).

As zero carbon producing energy systems are identified as the ideal generators of sustainable power (such as solar and wind), energy justice helps to focus the moral mind of policy makers on how and where generated energy should be distributed, in order to support all global citizens in meeting their personal, social and economic needs for development. In summary, it is the philosophical guide to making energy policy more sustainable through equity.

As highlighted by the UN's World Economic Social Survey (2013), global sustainability targets are being sacrificed for the rapid achievement of economic growth, most notably in developing countries. The various generalised sustainable development goals lack clear implementation methods, especially with regard to the varying speeds, needs and characteristics of urbanisation within specific nations and regions, whilst continuing to ignore social aspects of sustainable development. The Human Development Report (HDR) of the UN Development Program (UNDP) underlines how a vast socio-economic diversity exists within countries with a lower-middle income economy, such as India, via the Human Development Index (HDI). Looking beyond gross domestic product, this index attempts to demonstrate and calculate a broader definition of well-being, by quantifying three dimensions of human development: a long and healthy life

(measured by life expectancy at birth); being educated (measured by adult literacy and enrolment in primary, secondary and tertiary education); and GDP per capita measured in U.S. dollars at Purchasing Power Parity. According to recognized Indian commentator Palagummi Sanaith (2007), India rose from being ranked number eight in the Forbes list in 2006, to number four in 2007 in the dollar billionaire rankings. However, it slipped from 126 to 128 in human development, under the UN Development Programme.

Many academics argue that such a situation is down to the widespread existence of fuel poverty and that a more equitable distribution could drastically improve the quality of life throughout developing nations, regardless of their individual characteristics (Guruswamy, 2010). The availability of renewable energy services within developing nations would provide numerous benefits in terms of economic and social development. These range from improved agricultural practices, to better access and exposure to information and markets, which assist with improving trade (GNESD, 2007).

However, it is not just in developing countries that fuel poverty is evident. Within nations identified as having high levels of economic income, fuel poverty levels are not only present but are increasing. National statistics showed that in 2015, the proportion of households in fuel poverty in England was estimated at 11.0 per cent (approximately 2.5 million households), an increase of 0.4 per cent from 2014 (DBEIS, 2017, P.3). Other EU nations demonstrate similar household trends associated with fuel poverty, with Spain and Belgium reporting statistics of household inability to keep homes adequately heated being 9 per cent and 15 per cent respectively (Intelligent Agency Europe, 2009). However, levels of awareness across nations, regardless of their levels of

income, vary greatly. Many countries have few or no systematic policies in place to deal with the growing threat of fuel poverty. Since 2009, actions by EU countries have improved and are now framed by the directives of 25 June 2009 on gas and electricity. These put member States under an obligation to design and implement their own policy measures to combat energy poverty, by guaranteeing a supply of energy to vulnerable consumers and improving the energy efficiency performance of housing.

This obligation was implemented in the UK under the Electricity and Gas (Internal Markets) Regulations 2011. Whilst the electricity and gas directives do not define energy poverty, the objective qualifying criteria for energy poverty are still based upon the 10 per cent annual income expenditure figure mentioned above.

4.6 Contemporary Problems of Environmental Justice and Energy Justice

In addition to addressing issues surrounding ecological justice, the problems facing the achievement of environmental and energy justice regarding renewable energy systems, go beyond simple distributional issues. As highlighted by McCauley et al., justice within energy policy consists of three tenets; distributional, recognition and procedural justice (McCauley et al. 2013). It is within these three tenets that policy makers face obstacles in maximizing sustainability when developing renewable energy systems, with both top-down and bottom-up forms of implementation.

4.6.1 Top- Down Problems

From a top down perspective, all environmental policies involving the benefit of all are set by the government, implemented through complex multi-level, multi-agent interactions. However, despite the processes to shape and fine-tune legislation and policy measures which ensure the best possible outcome for everyone, injustices can still arise from the very processes designed to produce equitable outcomes, as discussed below.

4.6.1.1 Distributional Justice

As described above, the original focus of environmental justice was (and arguably still is) to identify the unequal distribution of environmental ills and their associated responsibilities within society (Walker, 2009); 'Environmental problems are a component of social exclusion and an issue of social justice' (Boardman et al. 1999).

An example of government taking responsibility for recognising specific rights in relation to impacts from an individual's environment, is demonstrated by the UK becoming a signatory to the Universal Declaration of Human Rights in 1948. This expressly stated that:

> "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services". (OHCHR, 1948, Article 25)

Other international examples which demonstrate the UK government's commitment to protecting individuals' right to health, include the UK becoming a signatory of the International Covenant on Economic, Social and Cultural Rights (ICESCR, 1966). This

expressly obliges the UK to protect the right to health. Similarly, through the European Convention on Human Rights (ECHR), the UK is a signatory to a convention which protects human health with respect to environmental injustices, even in the absence of specifically stated environmental rights that could be invoked directly. Human rights regimes can;

> "by viewing civil, political and economic rights as being impinged upon by environmental degradation, offer a degree of protection (albeit indirectly) to individuals affected by it" (Morrow, 2013, p.330).

Increasing attempts to advocate for the introduction of an express "environmental right" in the ECHR have since been made, notably by the Parliamentary Assembly of the Council of Europe (1999) (PACE), with differing levels of success.

However, it is only relatively recently that these responsibilities in the UK projected downwards from government, to move beyond only the responsibility to prevent environmental ills, but to specifically recognise individuals' rights. Limited examples of primary UK legislation demonstrate clear protection from environmental injustices. The Human Rights Act 1998 (HRA) has provided some level of protection to independent environmental rights, notably from public authorities, but successful challenges have centred on laws of nuisance rather than environmental injustice.

Recent evidence from UK courts, suggests that this narrow focus has changed. It demonstrates that the UK government can be successfully challenged should it fail to carry out its duty to adequately support the specific health needs of its citizens, rather than requiring a specific identifiable claim of nuisance. In the case of ClientEarth (No 2) vs. Secretary of State for the Environment, Food and Rural Affairs (SEFRA), the

Government was found to be unsatisfactorily addressing illegal air pollution across the UK, by failing to take measures that would bring the UK into compliance with the law "by the soonest date possible" (Per J Garnham, 2016, p 95).

Academic frustration is evident towards failings in the democratic process which result in climate change not being tackled. Climate researcher James Hansen (2009) demonstrates that the current democratic process in not working in adequately addressing climate change measures, whilst Dale Jamieson (2014), Professor of Environmental Studies, Philosophy and Law at New York University, comments on our ability to cope with such global threats that "we have not designed political institutions that are conducive to solving them...Sadly, it is not entirely clear that democracy is up to the challenge of climate change".

In light of such academic discourse, demonstrations of legal checks to environmental breaches of human rights are few. The legislation enacted upon which the courts rely, thus far illustrates a reluctance to become involved in regulating policy and convention commitments, particularly in the face of the environmental injustice of climate change - even more so, the express legal or political support for the promotion of greater distribution of specific benefits via environmental justice. Conversely, as mentioned above, energy justice is focussed on the positive improvement through the greater provision of benefits in response to environmental injustices.

The shortcomings of the government ultimately result in the failure to eradicate fuel poverty throughout the UK. However, the result may not have been caused by the simple fact of time expiration, but rather a number of negligent effects stemming from centralised decision-making processes. A key component of energy justice is

availability. The definition of ‘availability’ in this context is the provision of sufficient energy resources of high quality, which are a 'cornerstone of achieving energy justice'. This runs through the energy policy concerns of security and supply, sufficiency, and reliability (Sovacool, 2013, p16-17):

> “Availability is also comparative to the relative independence of a country's ability to procure energy fuels and services.” (Sovacool, 2013. p 220).

Whilst a variety of threats to availability exist and are conditional on the specific characteristics of a nation, it can be argued that the UK - despite its superior economic attributes - is a nation struggling to achieve valid energy justice on the basis of availability.

One threat to availability is that of the UK's underinvestment in energy infrastructure. Reports repeatedly underline the UK's offshore energy generating potential, with a recent report suggesting that the UK could achieve a baseline cumulative installed capacity of 25 gigawatts (GW) by 2030. This would be enough to power more than 20 million homes; almost 75 per cent of all households in the UK. (Wind Europe, 2017. p23)

However according to national statistics, worryingly, only 5,293 megawatts (MW) of installed capacity from wind farms were registered as of 2016 (DBEIS, 2017).

Academics such as Verbruggen et al. and Sen and Ganguly, have attempted to demonstrate the potential reason for such under-investment, by highlighting the barriers policy makers face when attempting to improve renewable energy development (Verbruggen et al.2010). These include potential market, internal awareness, and policy barriers (Sen and Ganguly,2017). Examples of these-restrictive market barriers created

by government as an explanation for its levels of underinvestment, include initial investment costs being too high for potential planners. These are rendered unaffordable due to inadequate governmental tariff support funding. In the UK, such self-imposed internal awareness barriers may also come in the form of an inadequate educational and vocational support provision. There is a need for skilled workers with specific renewable energy systems training, which is vital to the industry's success. Skills required to install, operate and maintain renewable energy hardware, are important to successful project implementation (Martinot, 1998). Without employment training to undertake such skilled work, there may be negative impacts such as damage through misuse and delays in repairing these systems, which would cause delay in achieving the optimum availability of sustainable energy. Furthermore, by limiting understanding of the technical and financial aspects surrounding the implementation of a sustainable transition away from conventional fossil fuels (Henriques and Sadorsky, 2008) it also contributes to an intergenerational knowledge gap. Addressing such impacts could positively effect both future and current working members of society, whilst potentially also helping to improve the attitudes of a community towards the value of a renewable energy system such as an offshore wind farm.

Other threats hindering the availability of just energy distribution, may occur in the form of governmental policy. Modification of existing laws and regulations through government policy is vital in order to introduce and promote renewable technologies (Casten, 2008). However, by unequally favouring one tenet of sustainable development when establishing a policy rationale, this can have a longer-term detrimental affect by inadvertently introducing legal barriers for future progress towards greater holistic levels of sustainable development. This issue in the UK is demonstrated by the

government's early cancellation of financial subsidies for onshore wind farm investment (DECC 2015), the reduction of support through feed-in tariffs under the renewable obligation subsidy for solar panels on domestic roof tops (DECC 2015), and during the operation of the Warm Front Homes Efficiency Scheme (WF Scheme).

The WF Scheme was initially introduced under the Warm Homes and Energy Conservation Act 2000, to combat growing poverty levels within the energy sector. This was

> "A major component of government strategy to eliminate fuel poverty…and enable the poorest households to maintain healthy indoor temperatures" (Critchley et al. 2007, p.155).

This made significant strides towards addressing the fuel poverty crisis between 2001 and 2011 (Sovacool, 2013, p.49). However, following a government spending review, the scheme was amended, resulting in significant restrictions on the eligibility criteria under the WF scheme. These restrictions coincided with gas prices rising by 15 per cent between 2011-2012 alone, whilst domestic electricity prices increasing by 75 per cent between 2004 – 2012 (Vukmanovic, 2011). The government labelled the restriction an attempt to form a "smaller, more targeted WF Scheme". However, it had the effect of curtailing the much-needed distribution of support to fuel poor households, at a time when fuel poverty was rapidly increasing (Guertler, 2012, p.95). Not only this, but the Government ended the WF Scheme a year later in 2013, despite the increasing numbers of fuel-poor households.

Such political decisions negate the progress of developing sustainable energy sources in several ways. Firstly, by restricting the options available to potential investors and individual consumers – especially those with limited funding. It is argued that initial

investment to support those alternative renewable energy sources with potential for future development, would be too costly in comparison to the financial return. This is whilst restricting the choice available to individuals when deciding on the medium to long-term energy sources best suited to their personal fuel needs. Secondly it negatively impacts sustainable development, by reducing energy security which would aim to diversify supply options and reduce dependence on conventional energy sources. Diverse and decentralised energy source technologies, such as distributed generation sources that are on or near the end-user, increase energy efficiency. This is achieved by improving load-factors, increasing cash flows, lowering capital expenditure through reducing the overall size of the generating equipment and/or site designation, and minimising potential financial loss through energy transmission and repairs (Guertler, 2012. P21-24).

4.6.1.2 Recognition Justice

Social theorists such as Nancy Frasier, argue that effective contemporary SD values the importance of equitable distribution, but that basing the definition of justice solely on distributional issues would be erroneous. Frasier particularly identifies maldistribution as a conclusion of injustice, whilst non-recognition is a separate form of injustice that determines maldistribution of justice (Fraser, 1997). Building on Frasier's standpoint, David Schlosberg (2007, p18) attempts to provide a definition of recognition injustice as (1) practices of cultural domination, (2) patterns of non-recognition, and (3) disrespect through stereotyping and disparaging language. More specifically, the availability of preventive measures which set environmental and energy justice apart when calculating recognition justice. Elaborating on Schlosberg's definition, this

research will demonstrate how issues of recognition through the current top-down approach, are creating forms of maldistribution under the theory of energy justice.

Firstly, the cumulative effect of Schlosberg's definition suggests that recognition injustices may appear not only as a failure to recognise, but also as mis-recognising, people's views and needs. This occurs in such a way that they then become unimportant or overlooked (Schlosberg, 2003. p 82).

Evidence of this within the energy sector is demonstrated by private renters in the UK. National statistics indicate that in England, the level of fuel poverty is highest in the private rented sector (21.3 per cent of households) compared to those in owner occupied properties (7.4 per cent). At the same time, this showed the largest average fuel poverty gap of £410, compared to £175 for those in local authority housing (DEFRA, 2017, p 28). A lack of energy efficiency in households is one of the main reasons for this.

The standard measuring tool in England is the Standard Assessment Procedure (SAP) for the Energy Rating of Dwellings. The greater the level of a household's energy efficiency, the lower the amount of energy required to heat the dwelling. This will then be reflected in a higher SAP score. As illustrated by Figure 1 below, those fuel-poor households spend more money on heating than non-fuel-poor households. This is

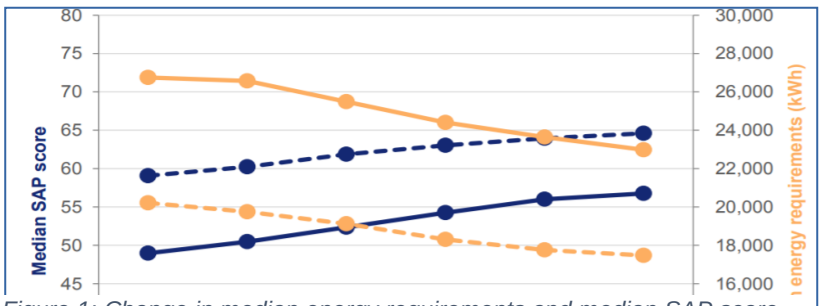

Figure 1: Change in median energy requirements and median SAP score, 2010-2015. Source: Department for Business, Energy and Industrial Strategy

because they have to spend more money in order to reach adequate levels of heating temperatures for their property.

Despite this, under current UK law, those private tenants are unable to make any physical changes to the property in order to improve energy efficiency levels, without the landlord's consent. Tenants living in rented accommodation may make a formal complaint to their local council, if a landlord fails to act in repairing a property should it be suffering from one or more Category 1 hazards under the new Housing and Planning Act 2016. However, the landlord is under no legal obligation to make improvements to the property which would otherwise improve its energy efficiency and reduce energy bills.

Further ways in which private landlords influence their tenants' energy costs, include their control over which supplier is used, and unclear or unlawful tenancy conditions which increase unnecessary costs to private renters. Research conducted by UK price comparison company Uswitch as part of a recent report, highlighted that over one in ten private landlords wrongly prevented tenants from switching energy suppliers. In this report, 36 per cent of landlords incorrectly believed that a 'preferred supplier' clause enables them to prevent tenants from switching suppliers. Together, these factors are estimated to have cost private renting tenants a collective sum of £161 million in lost energy saving opportunities (Uswitch, 2015).

Government reports show that in the early 2017, the average UK rental cost for a two-bedroom property was £1,151 per month (calculated from £13,812 per year) (Landbay, 2017). The median UK household disposable income (after direct taxes) was £26,300 in

the financial year ending 2016 (ONS, 2017), whilst the average UK house price as of July 2017 was £226,185. Lower levels of disposable income and greater costs of adequate heating expose private renters to prolonged levels of fuel poverty. The resulting house purchase price increase brings greater difficulty for private renters in two ways. Firstly, in purchasing their own more fuel-efficient property, which would have lower heating costs. Secondly, by purchasing a property where they could then make the required changes to increase energy efficiency and save energy costs in the long term.

Statistics show that should a household have low energy efficiency whilst being financially less able to deal with the impacts of a cold home, there is a greater risk of illness or even death to household members. Such statistics demonstrate that in 2011, excess winter deaths were almost three times higher in the coldest 25 per cent of housing than in the warmest 25 per cent (Institute of Health Equity, 2011). Similarly, in 2015/16 there were an estimated 24,300 excess winter deaths, with 15 per cent more deaths occurring in winter months than non-winter months (ONS, 2016). Approximately 41 per cent of excess winter deaths are attributable to cardiovascular diseases, and 33 per cent to respiratory diseases. At the same time, those households consisting of one or more people vulnerable to the effects of fuel poverty (such as single parent households, over 65s etc.) are also more likely to suffer from a variety of respiratory problems. For example; children living in cold homes are more than twice as likely to suffer from one or more respiratory issues than children who live in adequately heated households (Critchley et al. 2007).

Further studies have shown that it is not only the threat to physical health that increases with longevity of a household's exposure to under-heated homes, but also the threat to psychological health. Barnes et al.(2010) found that more than one in four young people living in cold housing for three to five years, experienced multiple factors increasing their risk of mental health problems. This compared to one in twenty-five adolescents living in warm housing. Whilst the threat to an individual's psychological health may be overshadowed by potential and actual damage to physical health (potentially due to difficulties in measurement compared to physical damage), Charles Taylor and Axel Honneth both emphasise the importance of psychological aspects of justice which are focused on an individual's self-worth derived from the recognition from others.

Taylor identifies two different forms of recognition: (a) the equal dignity of all, and (b) the politics of difference, where everyone is recognised for their particular characteristics:

> "Everyone should be recognised for his or her unique identity…with the politics of difference what we are asked to recognize is...their distinctness from everyone else" (Taylor et al.1994, 37-38).

Honneth (2005) explores the ways in which an individual's self-perceptions of their social status can be easily influenced through the unequal recognition of certain individuals or groups within a society. Honneth asserts that:

> "The thesis is that our identity is partly shaped by recognition or its absence, often by the *mis*recognition of others, and so a person or group of people can suffer real damage, if the people or society around them mirror back to them confining or demeaning or contemptible picture of themselves. Non-recognition or mis-recognition can inflict harm, be a form of oppression imprisoning someone in a false, distorted, and reduced mode of being." (Ibid, p25).

Honneth therefore argues that it is the *perception* of the mis-recognition by the victim that shapes the injustice, and arguably, how the fragility of self-esteem can determine that individual's approach to decision making.

In response to Honneth's emphasis on the psychological impacts of negative recognition, Nancy Fraser (2000) argues that this is misplaced She states that it is the damage to the social status itself (rather than a person's self-esteem) at the core of the theory of justice, i.e. the resulting product of 'institutionalized relation of social subordination'. Frasier bases her processes of mis-recognition on three principles. The first is a general practice of cultural domination, the second a pattern of non-recognition (essentially rendering the individual invisible), and the third is a practice of disrespect, where routine disparaging of individuals' social roles occur through negative stereotypic depictions (Fraser, 1998). Frasier critiques Honneth's politics of recognition standpoint, demonstrating that its sole focus is based on self-realisation and arguing that Honneth fails to recognise important institutionalised forms of mis-recognition (Fraser, 1998, p 24).

However, directly applied in the UK to energy justice theory, a combination of the two academic perspectives could help identify repeated cycles of specific forms of energy injustices towards private renters. It could also explain why such mis-recognition continues to influence individual involvement in decision making procedures, in turn negatively impacting the equitable distribution of environmental justice in the energy sector. Notably, Honneth (1995) demonstrates that self-esteem comes from various sources – not just from individuals, but from societal culture and the state. Honneth's secondary notion of disrespect that “refers to those forms of personal disrespect...by being structurally excluded from the possession of certain rights within a society”. Honneth (1995, p133), echoes Frasier's interpretation. For example, the Town and Country Planning (Development Management Procedure) (England) Order 2010

(DMPO 2010) requires a planning permission applicant to give notice to the landowner to which the application relates. This form of legislation expressly limits involvement to only the landlord (as the landowner). In situations where the application applies to privately rented property, it excludes private tenant(s), despite their obvious interests. Where such a situation creates disrespect towards an individual, albeit (supposedly) unintentional, it still leads to continuous forms of mis-recognition which likely impacts the private renter's self-esteem. This potentially reduces their own perception of their ability to contribute to these and other decision-making processes that could concern them. This is also reflected in both Honneth's third tenet of disrespect, and Frasier's first and second tenets respectively.

Similarly, it could be argued that the increasing costs of residential housing, perpetually prevents private renters from achieving adequate levels of involvement in communal decision-making processes, under Frasier's pattern of mis-recognition. There is a cumulative effect of steady house prices increases, rental price rises, and rising financial interest rates, combined with evidence that private renters paying more for heating due to their lack of involvement in decisions on residential energy efficiency (discussed above). These factors make it increasingly difficult for private renters to afford the purchase of their own property. This lack of 'homeowner' status negatively impacts their self-perceived social status within a residential community, by diminishing their self-worth. This devaluation of perceived social standing can then affect an individual's voluntary involvement in their community planning decisions, rendering them theoretically 'invisible' as reflected in Frasier's pattern of mis-recognition (Ambrose et al. 2016).

Further evidence of centralised mis-recognition is demonstrated in the wake of the Warm Front Scheme (WF Scheme). Once the scheme had ended it was recognised that it had made substantial progress towards combating fuel poverty between 2001 and 2011. However, further issues of recognition were evident. A number of reports identified that, under the scheme, assistance to those who were in the greatest need, were being overlooked. Tom Sefton of the London School of Economics calculated that in 2002, only 42 per cent of fuel-poor households were being reached under the WF scheme, whilst 75 per cent of participants did not fall under the definition of 'fuel poor' (Sefton, 2002).

Similarly, two years later, Sefton (2004) again found that just "less than one in five Warm Front recipients are fuel poor prior to receiving a grant...most recipients – around four in five – are probably not fuel poor."

Finally, the adoption of self-selection criteria by the WF Scheme supported an approach which combines Frasier and Honneth's viewpoints as arguably being best suited for future recognition justice policies. Placing the onus on individuals to apply for the scheme, a large number of genuinely fuel poor households missed out on this support. The targeting process by the government was arguably a major source of environmental injustice, echoing Frasier's second pattern of non-recognition.

Simultaneously, as highlighted by Benjamin Sovacool (2013, p65), the matter of an individual's self-perceived social standing and self-esteem, is also important when seeking to address injustices such as fuel poverty:

> "The largest reason behind the refusal to participants is simple: people either did not consider themselves fuel-poor or, if they were, did not want to admit it. Fuel

poverty takes a severe toll on households and as such it may have become stigmatized to the point where households feel that classifying themselves as 'fuel-poor' or even just poor is insulting."

This demonstrates the difficulty in devising adequate measures to not only identify all of those subject to energy and environmental injustices, but then convincing them to take part in such schemes without damaging their self-esteem, social identity and pride (Ibid).

Ultimately, this discussion highlights the ways in which centralised sources of mis- and non-recognition, can create direct injustices under energy justice and environmental justice theory. A combination of academic interpretative definitions of recognition justice support this. The injustices associated with this lack of recognition include such issues as a resulting lack of willingness to participate in decision making, as demonstrated in this sub-chapter. It can also affect other areas of environmental and energy justice that adversely impact levels of justice within sustainable development, and this is discussed below.

4.6.1.3 Procedural Justice

The procedures discussed above, create specific forms of environmental injustice through reduced or withdrawn involvement. The existence of procedural justice is of great importance in any proposed infrastructure project, not only for the potential stakeholders who could be affected by the project, but also the planners. This is because research suggests that if a group's involvement during the initial planning stage is judged to be fair, then stakeholders are more likely to hold favourable attitudes towards

the project and its leaders(Lind and Earley, 1992). Other advantages that arise, especially when NSIP planning proposals involve potential local stakeholders, include local insights into issues. Experts and planners may be unaware of these (Steele,2001), with academic opinion stating that local community input is vital in helping planners to overcome complex issues (Dryzek, 1997).

Within environmental justice theory, procedural environmental justice has developed from critique of the narrow distributive justice approach which surrounds inequitable distribution of environmental burdens and benefits. A critical focus has been brought to bear on the equitable access to, and involvement in, aspects of infrastructure planning such as information, consultation, control, participation and decision-making (Young, 1990).

Unlike distributive justice, its theoretical focus is not based solely on equitable output distribution, but requires a involvement throughout: “Procedural equity entails democratic participation not only with regard to distribution but in prior decisions affecting production of costs and benefits” (Lake, 1996, p.161).

Unlike distributive aspects of justice, this is much more difficult to quantify (Perrons and Skyers, 2003). Furthermore, some evidence suggests that the ways in which participatory procedures are conducted, are more influential in participants’ perception of a consultation process’s equitability/fairness, than the ways in which the benefits are to be distributed. This emphasises the subjectivity of each potential project's pre/post planning consultation process (Molm et al.2003).

Some academics have attempted to measure or define how effective stakeholder participation is and what it should include. One early attempt was introduced by Sherry Arnstein (1969), in her work to identify a 'ladder of citizen participation'. This used a scale ranging from high to low, when measuring the effectiveness of citizen

involvement in planning processes in the United States. Arnstein's ladder consists of eight ‘rungs’; the ladder being a guide to determining who has power during decision processes. When decisions are being made that could be categorised into one of the lower rungs, non-participation or tokenism can be seen as an unsatisfactory distribution of public involvement. See Figure 2 below:

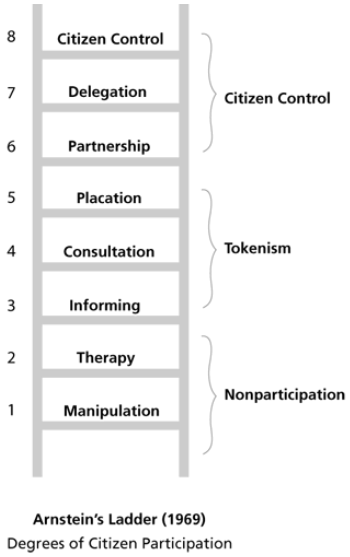

Figure 2: Illustration of Arnstein's progressive levels of power distribution within public engagement processes. Source: Arnstein, S. (1969) A Ladder of Citizen Participation. Journal of the American Planning Association, Vol. 35, No. 4

Soon after Arnstein introduced her ladder of participation, a more generalised form of social justice by John Rawls proposed three foundational dimensions of justice. These needed to be considered in order to design a truly reflective and equitable process.

Rawles' procedural justice requirements were: (1) access to justice – who is to be involved in such processes, (2) distributional justice – who gets how much of the benefit; and (3) procedural justice – how to decide the distribution of such benefits (Rawls, 2001).

More recent attempts to define equitable citizen participation, have led to one of the most notable commitments of a national government in multi-level governance. This involved the implementation of equitable regulation procedures, in the form of the United Nations Economic Commission for Europe (UNECE)'s Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters – more commonly known as the 'Aarhus Convention'. Signed on the 25 June 1998 and coming into force on 30 October 2001, the Aarhus Convention commits governments and public bodies under them, to interpret and promote the principles contained within the convention, through their own best practice interpreted to suit each country's unique jurisdiction.

This convention is based on three principles: access to information; public participation in decision making; and access to justice (UN Convention on Access To Information, Public Participation In Decision-Making And Access To Justice In Environmental Matters, 1998). This demonstrates that the public are required to participate not only in the decision-making process, but also in a problem solving capacity (Barry, 1996). However, despite the existence of such a widely embraced consensus on the need for effective public participation, there have been a number of criticisms regarding the effectiveness of implementation these three attempts to progress genuinely sustainable development.

Issues may arise from the subjectivity of procedural processes surrounding a proposed project, even if the requirements of all three popular general framework designs above are met. One problem can arise in relation to access, as considered by both the Rawlesian concept and within the secondary principle-pillar of the Aarhus Convention. This is also present in rungs four and five of Arnstein's ladder of participation. For example, when determining which consultation methods are best suited for a project, difficulties can arise for planners. These include factors such as decisions on how many suitable stakeholders may attend a single meeting, which may unintentionally restrict access to some of those who wish to attend. The typical open microphone format of such meetings would provide a platform for those with adequate/high levels of public speaking abilities, allowing these individuals to dominate the meeting, whilst inadvertently excluding others. Conversely, holding a series of smaller meetings to overcome this problem would take substantially more time. This could then lead to the exclusion of stakeholders with particular commitments (such as conflicting hours of employment, childcare responsibilities etc.), whilst still failing to prevent the smaller meetings being dominated by accomplished public speakers (Grossardt and Bailey, 2007).

Despite the generally positive effect of the Aarhus Convention in enhancing access to justice, the UK has specifically been singled out as consciously restraining citizen access to justice. This is highlighted by the Aarhus Convention Compliance Committee's published report, highlighting legislation introduced under the Civil Procedure (Amendment) Rules 2017. This amended cost caps for unsuccessful claimants in environmental cases previously set through the Criminal Justice and Courts

Act 2015. The report highlighted that the removal of the advance certainty of financial liability for claimants, acts as a deterrent to individual claimants and groups. Many of these have limited funding options when pursuing legal remedies to environmental injustices created by public bodies (United Nations, 2017).

Further issues surrounding interpretation of the Aarhus Convention, demonstrate that the lack of detailed standard procedures can prove costly. Without a clear strategy, varied interpretation by public bodies could create an unsatisfactory application of the Convention, leading to wasted time and resources during the first implementation attempt (Lee and Abbot, 2003). Should a member of the public wish to raise a grievance against such a procedural shortfall, they may do so under Article 15 via the Aarhus Convention Compliance Committee. However, decisions of the Compliance Committee are non-binding and are merely made in the form of recommendations to the full Meeting of the Parties (MoP), causing greater delays in obtaining remedial action and delaying procedural justice that better reflects the consensus.

Another problem could arise when identifying the most appropriate decision-making method to determine the most suitable solution, under both the third Rawlesian requirement and the second principle of the Aarhus Convention. A range of options may be presented in such a way that the professional planner's preferred option appears to be the best technical solution for all parties involved. This would optimise the decision-maker's power, whilst minimising the potential for justice (Bevan et al.2006). At the same time, members of the public may believe that the range of potential options are being purposefully limited to those best suited to the planner's best interests. However, without professional knowledge they would be unable to prove this, creating mistrust

within the procedural relationship. This would reduce an individual's overall satisfaction with the outcome, regardless of the equitable distribution of benefits (Walker, 2009). Such situations would be classified as the first rung of Arnstein's ladder, transforming a potentially problem-solving procedure into one that is merely formulaic and incapable of achieving equitable involvement.

Finally, top-down issues of procedural justice derive from the need for all citizens to have equitable rights of access to procedures within SD. The issue with this principle, is that this duty to uphold citizens' rights of access to information is only applicable to public authorities under Article 4 (UNECE, 1998). This allows private bodies to be exempted from providing this access under the Convention (Mason, 2010). Whilst this is a considerable obstacle for citizens' early involvement, the Convention strengthens citizens' information access rights regarding environmental matters, by demonstrating that privatization 'cannot take public services or activities out of the realm of public involvement, information and participation'. (Annan, 2000). This would not be a legitimate defence should a body fail to satisfy a claim for access. The Convention achieves this under Article 2(2)(c) with the statement that:

> "any other natural or legal persons having public responsibilities or functions, or providing public services, in relation to the environment, under the control of a [governmental or administrative] body or person".

This is similar to the UK's Human Rights Act, where the definition of a public body includes "any person certain of whose functions are functions of a public nature" (S.6 (3)(b) HRA 1998).

4.6.2 Bottom-Up Contemporary Problems and Limitations

In contrast to the top-down policy enactment perspective, the bottom-up model views citizens themselves as the initiators of political and social change, influencing legislation and policy as the first receivers. However, limitations to SD can also stem from the citizens themselves, during attempts to improve the application of SD. An example of this is 'NIMBYism'.

4.6.2.1 NIMBYism

One of the biggest contemporary problems facing sustainable development, especially nationally significant infrastructure projects (NSIPs), is public opposition to the introduction of new sustainable projects. As highlighted above, effective public involvement is important in the planning process when introducing energy projects. Some academics have labelled those with negative responses towards the introduction of NSIPs in a particular area, as NIMBYs ("Not In My Back Yard") (Devine-Wright, 2010). This a pejorative label is applied to those members of a community who oppose new energy projects, based solely on the fact that they would be sited near them. However, these objectors still recognise the need for such a development, albeit elsewhere.

Some academics conclude that part of the underlining rationale of NIMBYism lies with the 'deficit model' presumption. This assumes that the role of the community is as lay people, ignorant of technical issues and unable or unwilling to engage with policies around new technologies (Wynne, 1982). Other impressions of NIMBYs assume that

the rationale for objection to NSIPs by locally concerned protest groups, is the consideration of self-interested values. These include concerns for impacts to their own individual utility, such as the decreased valuation of home owners' properties, as illustrated in the 'social dilemma' theory (Chowdhury and Samuel, 2014).

However, there has been substantial academic discourse that refutes these local responses to project proposals, whilst labelling public opposition or lack of involvement in planning participatory stages as the inadequate generalisation of a community that perceives a range of reasons for opposition. As Mcclymont and O'Hare (2008, p.332) demonstrate:

> "The label is often utilised in an attempt to dismiss the arguments of a group as purely self-interested or to discredit the activities of those that mobilise. Yet, at the same time, such groups often become incredibly active in attempting to protect and promote "their community", and possess those very attributes deemed characteristic of an idealised "sustainable community".

Bell et al. (2005) also critique the use of the NIMBYism label, due to its failure to acknowledge and reflect the complexity of human motives and how these interact with social and political institutions.

Bell et al. identify potential explanations for the gap between the supposed public support for wind energy, and successfully increasing wind energy capacity. They initially identify two gaps; the 'social gap' and the 'individual gap' (2005, p 461). Predominantly focussing on the former, Bell et al. propose three different explanations for the significant difference between the high public support expressed for wind energy

in opinion surveys, and the low success rates of wind power development planning applications. Using Bell et al.'s three potential rationalisations for explaining this gap, together with the stances of Honneth and Frasier on recognition injustice, this thesis will propose another potential explanation for this social gap. It will use the potential grounds of injustices discussed above, to propose a new concept of 'Area Input Theory'.

4.7 Area Input Theory

Area Input Theory suggests that the reason for such a social gap is not predominantly caused by NIMBYs' rejection of a planning proposal based upon a lack of benefit under the free rider theory. It is rather a result of procedural, distributional and recognition injustices (as argued by Frasier, above) acting to marginalise members of a community so that they perceive themselves to be of little value to that community. In this way, they come to believe that their views on issues surrounding planning do not matter (as argued by Honneth, above). Private renters may feel that their social worth to the community is based on their direct contribution to that community. For example, homeowners contribute directly to a specific community through house purchases, which usually coincide with registering within that area to vote etc. However private renters, especially those who move every couple of years and are not registered to vote, do not know their neighbours well enough etc. They may not feel that they have a duty towards their community or believe that they will make a difference.

Toke's research (2002) disputes an important accepted view. This states that the NIMBYistic viewpoint is related to location, and that the closer an objector lives to a proposed RES, the more likely the individual will be to oppose it. Toke's case study

used a consultation process with the local community about the Carno wind farm in central Wales. During the wind farm's initial consultation process in 1994, there were 47 objectors (primarily concerned with the visual impact) and 40 supporters of the introduction of the wind farm. However, during a random survey conducted by researchers from the University of Wales only a few months after the planning consultation process, it found that support of the wind farm proposal from local residents located only a few miles away, outnumbered the objectors by 74 per cent to 23 per cent. The results of this study suggest that the underlying rationale of the NIMBY theory does not explain the social gap.

Toke's stance is reflected in Bell et al.'s first possible explanation for the social gap. Under what they describe as 'the democratic deficit explanation', Bell et al. suggest that the outcome of the planning permission process will not necessarily reflect the will of the majority. One possible argument under the area input theory suggests that in the problematic participatory scenario above, there may be concerns as to the level of subjectivity during a typical open microphone meeting. This scenario enables those with adequate/high levels of public speaking abilities to dominate the meeting, whilst inadvertently excluding others. The impetus to speak in this situation could be driven by a perceived sense of duty to act on behalf of their community, neighbours etc. Long term home owners would be much more likely to experience this, whereas private renters who may have moved to a community relatively recently, will have built up little social standing within it (especially if they are unsure as to whether their views match the majority of the community). This may result in a few people dominating participatory situations. Such scenarios could thus lead private renters to contribute little or nothing during consultation meetings, essentially rendering their standpoint

'invisible', as per Frasier's second pattern of mis-recognition. This in turn could severely impact an individual's self-esteem and result in them being less likely to provide any input to future meetings/consultations. This would reflect Honneth's viewpoint on the importance of the value of an individual's self-worth and would provide a potential explanation as to why particular injustices which involve procedures and recognition, are perpetuated within planning.

There are other potential explanations for disproportionate representation at public speaking scenarios. For example, it could be that vulnerable members of a community cannot afford the time to participate, due to personal commitments. Research suggests that single parent households and/or those on lower income - key characteristics of households susceptible to fuel poverty - are most at risk of being excluded from the dialogue (Meier and Rehdanz, 2009). These types of households are more likely to be private renters due to restricted levels of income who would arguably be less able to bear the cost of taking time off work or arranging additional childcare, in order to attend such consultation meetings.

Another potential restriction to the participation of vulnerable community members, could be the way in which planning information is distributed. Older people (over 65s) may be less proficient in accessing electronic communication and information dissemination in comparison to younger, more experienced IT users. This may lead to information about a consultation being missed or misunderstood, resulting in the opinions of this group being inadequately represented. This highlights potential procedural injustices as emphasised by Frasier above. Addressing these issues through improved, target-specific communication about consultation meeting would assist, but would potentially lead to increased costs for planners.

Bell et al.'s second and third potential reasons are the 'qualified support explanation' and the 'self-interest explanation', which are closely linked with the area input theory. The former explanation suggests that "most of the people who support wind energy do not support it without qualification" (2005, p.463), whilst the latter highlights that an individual's decision is based on a balancing of community benefits as opposed to their own personal potential gains and losses. For example, as demonstrated by Bell et al.:

> "In a multi-person prisoner's dilemma it is collectively rational for the public good (wind energy) to be produced but it is individually rational for each individual to 'free-ride' on the contributions of others (not have a wind farm in their area)." (Bell et al. 2005, p.465)

Area input theory could also explain why the opinions of private renters are not being represented, thus contributing to the social gap. As highlighted by several academics it is hard to differentiate between people motivated by self-interest and those who genuinely hold a general principle of qualified support (Elliot, 1994; Kahn, 2000). As renters can remove their commitment to a community relatively easily by moving, their level of qualification for support is less than that of a homeowner.

Simultaneously there is nothing to prevent individuals from making their decision solely based on the free-rider theory, and it is only natural that some are bound to do so. Therefore, under the area input theory, if the qualification of private renters is increased (through the creation of positive self-interest etc.) then this could help bridge the social gap. The effects of this could potentially combat the repeated negative outcomes identified within Frasier's mis-recognition theory. This in turn could reduce the distributional and recognition injustices created by limited or boiler plate consultation procedures during a wind farm planning process. Examples of these improved processes

could be increased levels of intergenerational employment opportunity. These may include improved engineering, operational and educational opportunities throughout the local community, designed for a variety of target audiences. In this way, the benefits of renewable energy sources might be better assimilated, with intragenerational opportunities through vocational schemes and co-ownership (as further discussed in the following chapter).

The inconclusive and vague application of the NIMBYism theory therefore provides little explanation for the potential environmental injustices surrounding wind farm planning consultations. Neither does it provide any explanation for the social gap highlighted by Bell et al. Conversely, the area input theory outlined above does propose an explanation, founded on, and supported by, academic argument.

4.8 Summary

This chapter has examined the application of environmental justice within the energy sector, by highlighting key issues from both top-down and bottom-up perspectives. This has been achieved through examination of the various components and academic definitions of environmental justice theory.

It has also used the area input theory to critique the NIMBY theory, providing an alternative reason for the failure to bring wind farm plans to fruition, despite general support for offshore wind farms being evident in various opinion polls and questionnaires across the UK.

To further support the area input theory, the next chapter of this thesis will suggest potential remedies to the current forms of environmental and energy injustices described in this chapter, using contemporary case studies to demonstrate how these remedies will be achieved. Also, a number of case studies will address further issues of on-going ecological injustices, the remedies for which may form components of a draft framework for policy makers and planners in overcoming such injustices.

Chapter 5 - Utilization of Paradigms to Create an Improved Model of Sustainable Development

5.1 Introduction

As discussed in the preceding chapters of this thesis, competing interests and interpretations within a society create difficulties for the application of a holistic model for sustainable development. Inflexible top-down linear flows of information and remedial options fail to adequately consider all complex and diverse social perceptions and motivations within a community. This creates a limitation or mis-representation of a community's values with regard to sustainability-related decision-making processes (Sharman and Howarth, 2016). This restricted representation of community values limits public engagement and trust with policy actors in the problem-solving process. This in turn increases the difficulty in obtaining suitable remedial policies for that community, particularly in relation to energy policy (Cox, 2010).

For example, when considering alternative low carbon energy options with regards to climate policies, some individuals in a community may only be concerned about financial impacts to themselves and may be more likely to favour the least holistic sustainable option in terms of development if this avoids financial loss. Conversely a predominantly ecocentric standpoint could favour the least practical and most expensive option available, so long as its implementation refrained from encroaching on the habitat of a species. When considering such polarised values, it has been argued that the key to maximising individual engagement is not to focus on the dividing margins of interest with regards to policy measures, but rather to focus on the overlapping

perceptions and motivations. This allows the formulation of improved models for holistic social shift in sustainable development (Shove, 2010).

McCauley and Heffron (2018) demonstrate that by adopting a 'just transition' framework, a triumvirate of justice tenets (distributional, procedural and restorative justices) can correct inequalities within environmental, energy and climate elements of SD from an interdisciplinary perspective. McCauley and Heffron conclude by proposing that the challenge for academics, is to further investigate the utilization of these three tenets to improve the multidisciplinary application of energy, climate and environmental justices:

> "We call on justice researchers to explore the multiple implications of the transition to a post-carbon society through the application of this new triumvirate of tenets (distributional, procedural and restorative)." (McCauley and Heffron 2018, p 5)

Taking this into account, this chapter attempts to synthesise the competing interests surrounding the interpretations of sustainable development, into one theoretical remedial option. This aims to provide a community with an improved model of SD, through strengthening the theoretical application of social, ecological, energy and environmental justice. By examining recent advancements within the wind energy sector together with critical analysis of alternative practices used within the Danish renewable wind energy system, this thesis compares these practices with those currently implemented in the UK. This will identify elements that could be integrated with a process of re-industrialization, to improve the interdisciplinary application of sustainability through NSIPs.

5.2 Rationale for Floating Turbines – An Ecological Justice Perspective

During a wind farm's lifespan, the most likely threat of negative environmental impacts will be during either the construction phase, or decommissioning phase. This is particularly true during the installation/removal of foundations and cables (Topham and McMillan, 2017). Environmental threats may still occur during operation, but this would likely be during maintenance/repair procedures. The sensitivity of an implementation site should be (under the achievement of true SD) always at the forefront of owners', planners' and operators' minds, throughout the lifespan of the farm.

As discussed in the above ecological justice chapter, the effect of pile driving during construction of offshore wind turbines leads to population displacement and behavioural change in the marine fauna.

> "A critical element of wind energy planning is developing projects in such a way that we avoid or minimize negative environmental impacts those installations may cause" (Miller, 2014).

The decommissioning stage of a wind farm is also a point at which caution should be exercised by both planners and operators, for the restoration of the site to its original state, prior to the wind farm construction. This is because various stages of the decommissioning process pose risks to site preservation. One example was demonstrated by the Yttre Stengrund wind farm in Sweden, when the dismantling of wind turbines at sea created contamination issues as the deconstruction at sea needed several operation liquids to be drained on site, raising the risk of site contamination. Failure by those operating the wind farm to adhere fully to the decommissioning provisions within the amended Energy Act 2004, could become extremely costly for those owner/operator parties concerned, under the 'polluter pays' principle.

However, through the alternative use of floating offshore wind farms, remedies could be implemented to overcome the aforementioned negative impacts created by the construction and decommissioning of fixed-foundation wind turbines (Teilmann and Carstensen, 2012).

5.3 Ecological Benefits from Floating Turbine Implementation

From an ecological justice perspective, the number of potential negative influences upon the local marine environment attributable to fixed monopile turbine construction, could be avoided. At the same time, remedial measures would provide additional ecological benefits.

Firstly, installing floating turbines would not require the use of pile driving to create the necessary fixed foundations. This means that the potential for the displacement of fish stocks and movement of sediment would be vastly reduced, if not completely avoided (complete avoidance of disruption may not be feasible, as the method used for power cable installation may still be problematic).

However, one ecological advantage could inadvertently be lost through the lack of installation of a fixed foundation. Evidence suggests that solid structures on the seabed can act as artificial reefs (Bohnsack and Sutherland, 2012; Reubens et al. 2011) serving as habitats for specific fish species (Wilhelmsson et al. 2006) and invertebrate assemblages (Kerckhof et al. 2010). A potential solution could be to provide a similar

form of fish aggregating device (FAD) or floating artificial reef connected to the floating turbine, partially/fully submerged at a chosen depth. Such FAD options would provide refuge for juvenile fish (Castro et al. 2002) and contribute to bolstering populations of various fish species throughout the year (Dempster, 2005).

An additional advantage of offshore floating wind turbines could be the introduction of aqua-cultural farming. Components could be attached to the tethering lines in some form, to help reduce pressure of commercial competition over increasingly limited available space, whilst providing a commercial model for increased benefits provided by the wind farm (Van Den Burg et al. 2017).

5.4 Social and Economical Influences of Floating Wind Turbines

5.4.1 Potential Social Disadvantages

Concerns surrounding the implementation of wind farm projects are widely varied, impacting local stakeholder acceptance due to noise pollution (EEA, 2009) spoiling scenic landscapes (Warren and Birnie, 2009). causing knock on affects such as perturbing property prices and discouraging tourism (Broekel and Alfken, 2015). These examples are well documented (Bell et al.2005; Wolsink, 2007; Haggett, 2008;) - even to the extent of being reflected in a number of enacted pieces of legislation and policies. For example, in the UK government's Energy White Paper, community resistance to clean energy projects was depicted as a serious barrier in achieving carbon emission reduction targets.

In addition, Section 85 of the Countryside and Rights of Way Act 2000 (CROWA) places a duty on all relevant authorities to ‘have regard to the purpose of conserving or enhancing the natural beauty’ of areas of natural beauty (AONBs). This applies when determining any planning decisions or carrying out activities concerning the land within these areas. Activities and developments outside the boundaries of AONBs that have an effect within the designated area such as visual impacts, are also covered by the ‘duty of regard’.

5.4.2 Social Advantages

Community concerns can be readily allayed using floating wind turbines. By having the ability to locate a wind farm in deeper waters further from the UK coastline, this could negate the majority of perceived concerns around the visual and/or noise intrusions of offshore wind developments (Wolsink, 2007; EEA, 2009). Such elimination of negative perceptions could ultimately boost public acceptance for such developments and increase positive feedback during the public consultation process.

5.4.3 Economic Advantages of Floating Wind Farms

From the owner/operators' perspective, various financial benefits can be derived from implementing a floating wind farm as opposed to a fixed foundation option. The overall purpose of an offshore wind farm is to convert kinetic energy from wind into electricity and as such, the quality of the wind regime (e.g. strength, consistency) is vital to the consumer energy supply. Data indicates that those areas within the UK REZ with the highest energy potential are in areas of open ocean, with the lowest energy yielding areas located close to shore where lower average wind speeds prevail (Cavazzi and Dutton, 2016). Floating turbines allow the planner to identify potential farm location sites within high yielding REZs to maximise production.

Similarly, there would be significant financial benefits surrounding the installation and decommissioning/dismantling costs, with the main aim of minimising construction cost being to transport the turbine in as complete a state as possible (Kaiser and Snyder, 2012). Floating turbine construction provides several ways of achieving such aims,

significantly reducing installation costs in the process. For example, by constructing the turbine and offshore platform at port and then towing them to site using a specialised vehicle (Castro-Santos et al. 2016), this would simplify construction operations. It would reduce time and expenditure involved with setting the foundations and installing each turbine at sea.

Furthermore, offshore wind projects are designed based on site specific conditions. The way in which these conditions impact design factors, mean that installation costs may increase due to the chosen specialised turbine and foundation type. This in turn may increase the time and complexity of construction. For example, foundation costs are linked to water depth, which impacts the financial viability of the foundation technology to be implemented. Current reports suggest that monopile foundations are the most commonly used foundation type in shallow waters (below 30m), followed by jacket foundations in transitional water conditions (30-60m) (Cavazzi and Dutton, 2016).

Floating wind turbines increase site options through their ability to be located further out to sea. Due to contemporary engineering techniques, together with constructional and economic viability limitations, there is a lack of contemporary universal turbine foundations which allow full locational exploitation of the UKs Renewable Energy Zone (REZ) (Cavazzi and Dutton, 2016). This means that the current options of fixed foundation turbines are only viable within certain water depths ranges (EWEA, 2013). However, while costs of monopile and jacket foundations are based on empirical data from existing instillations, floating foundations are still in the early stages of characterisation. Their particular cost figures may therefore initially have a broader initial range of estimation, which should be considered by investors.

Regardless of this, the overall result of a reduced need for specialised and costly sea vehicles, such as a floating crane, would be substantial (especially should such vehicles be in high demand, leading to costly delays in obtaining the equipment). Similarly, at the end of the turbine's lifespan, reversing the construction would mean that such complex and costly equipment would again not be needed. The turbine could be towed back to a designated port complete, so that the relevant deconstruction operations could take place onshore or in shallow water, again reducing time spent at sea.

As demonstrated by the previously mentioned Yttre Stengrund wind farm, replacing individual elements of a fixed turbine can be extremely costly and time consuming, whilst the increased length of turbine downtime can culminate in additional financial cost to the operator. Yttre Stengrund demonstrated this to such an extent that the best financial option available was to cease operation entirely:

> "The difficulty in getting hold of spare parts and the huge cost involved in upgrading the turbines and gearboxes meant that it wasn't financially viable to replace the turbines" (Hassel, 2016).

Dismantling can be delayed by bad weather, as also demonstrated by the Yttre Stengrund case study. Floating options could alleviate such issues, as they would simply require disconnection and direct towing to port, where deconstruction or repair would then take place. This would remove the need for unnecessary or time-consuming work to be conducted at sea, minimising the potential for additional delays and avoiding additional costs associated with site contamination.

5.5 Implementation of a Decentralised Network Supported by a Zero Carbon Primary Energy Source to Enhance Efficiency and Autarky

The implementation of a specifically designed subsystem for the distribution of this energy, is another potential improvement to sustainable development. This could be achieved through a Grassroot Initiative program, using a combination of both traditionally distinctive characteristics commonly seen in centralized grid systems, and a hybrid decentralized model of energy grid. This would improve energy autonomy, energy efficiency and economic benefits throughout a community.

Grassroots Initiatives (GIs) support local and regional initiatives, established by groups and communities aiming for more durable energy systems within a specific local environment. Collaborations between local authorities, NGOs and businesses, work on bottom-up activities to promote smaller scale progression as an alternative to the more familiar paths of national scale transition (Kooij, H. et al. 2018). The rationale for focussing a project on a community population as opposed to a national population, is reflected by the environmental sociologist Robert Brulle. He highlights that in the U.S., there is a multiplicity of environmental discourses within a society. These various discourses create fragmentation of the American environmental movement and prevent it from speaking with a single, unified voice. Because of this, effective environmental change becomes unachievable (Brulle, 2000).

This observation on the environmental discourse in the U.S. can be applied to the UK. As highlighted earlier in this thesis, discussing the competing interests within sustainability and producing a single, national policy framework would be difficult, if it

were to adequately satisfy range of interests and values of the many regions across the UK. However, it may be possible to identify a region which predominantly shares the same norms and values whilst being subjected to particular disadvantages, such as environmental and energy injustices. It could become easier to achieve successful implementation of a project which simultaneously satisfies the wants and needs of a struggling community and increase clean energy sources.

Depending on the supporting conditions, the implementation of clean energy sources can benefit a community in various ways. As such, there is increasing support for specifically located and distributed energy projects, which are being identified as a preferable alternative to the traditional models of energy production and distribution. (Del Rio and Burguillo, 2008; Chicco and Mancarella, 2009).

As discussed and emphasised by Müller et al. (2011), such bottom-up energy projects which contribute to a singular energy subsystem, can introduce levels of 'energy autarky' for the benefit of a community/region. Whilst 'energy autonomy' is a more familiar concept, 'energy autarky' is less commonly understood.
'The term 'autarky' is derived from the Greek word *autarkes* and means ‘economic independence or self-sufficiency’. In contrast, the term 'autonomy' refers to ‘freedom from external control or influence’ and self-government.' Therefore, energy autarky exists where a community does not import substantial amounts of energy resources from other regions, but rather relies on its own resources to satisfy its energy requirements. Should a community implement a decentralized subsystem where its primary energy input is derived predominantly from local energy resources, then aspects of sustainable development can be improved.

An energy system's efficiency level can be substantially improved through the deployment of an autarkic energy subsystem. This creates shorter and more direct methods of transporting energy from production to final consumption. Due to the need for conventional energy systems to import primary energy from outside sources, a substantial amount of exergy (the maximum useful work possible that can be obtained during a process) is expended, with further exergy being lost converting such primary energy into final energy that can be utilised by the consumer. Conversely, through the loss of exergy, entropy (the amount of disorder in a system, or the measure of a system's thermal energy per unit that is unavailable for doing useful work) is generated (Atkins, 2010), reducing the overall level of efficiency of the system in question. Unlike existing conventional grid systems, an autarkic subsystem would implement a shorter, more direct means of transporting energy from generation points to end use, reducing the opportunity for exergy to be lost and for entropy to increase. Furthermore, a decentralised autarkic subsystem could be designed to facilitate a range of end user points, which would reduce/avoid forms of grid transmission congestion and improve overall security of supply (Renewable Energy Association, 2016).

5.5.1 Social Benefits of a Decentralized Energy Subsystem

The implementation of community-focussed renewable energy technologies is identified as a way to achieve better levels of community engagement and empowerment, together with self-sufficiency and local determination (Walker, 2008). The increasing levels of social focus within an autarkic subsystem will help to counteract the procedural injustices demonstrated in conventional planning project consultation processes. As the local population are both initiators of change and consumers of energy, community involvement should be a serious consideration for any operators of a bottom-up energy project (Zoellner et al. 2008).

As a decentralised subsystem, the primary concerns and benefits will be specific to that region. This makes it even more vital that members of the local community are meaningfully involved in the planning process, rather than merely offering them the closed forms of compensation often associated with failed planning applications (Aitken, 2010; Dryzek, 1997). This would make it extremely difficult for planners to justify ignoring the needs and concerns of the local community, as establishing positive community associations is an important requirement for the success of any community energy project (Müller et al. 2011).

The economic and social benefits for such an autarkic community, can be significant. Conventional UK energy systems rely to varying degrees on imported fuel sources as their primary energy input, with the majority being forms of fossil fuel. This creates a substantial outflow of capital, resulting in increased levels of generated income flowing outwards. This means that contributions to the region's economy are diminished (Müller et al. 2011). Conversely, an autarkic subsystem would derive much of its primary

energy from within the region/community and refocus the flow of capital such that it remains within the local economy. This would increase the contribution to the community's economic viability and would extend and strengthen value creation chains within the local area.

5.6 Utilizing Offshore Wind as the Primary Source in the Energy Autarky Framework

To this point, discussion within this chapter has separated the potential benefits from the theoretical implementation of floating wind turbines, and the employment of a framework founded on the concept of energy autarky to improve regional development. However, there is additional potential benefit offered by utilising a combined method of a decentralised energy subsystem, in which its primary power source stems from an offshore wind farm sited within/near the region. Not only would such a system substantially contribute towards reducing national carbon emission targets, it would also significantly benefit the regional population by improving social, ecological, environmental and energy justice levels amongst coastal communities, as discussed in the preceding chapters of this thesis.

5.6.1 Rationale for the Re-Industrialization of Coastal Communities Across the UK

Traditionally, many UK communities built their collective identity from industrial employment. The resulting economic trade helped subsidise the area whilst keeping the

community close-knit, through a combination of similar employment throughout a single community, coupled with economic gain and pride for their exported product/s. For example, Sheffield was widely known for its steel industry, many parts of Wales for their coal production, and Stoke-on-Trent for its pottery industry. However, for many reasons (such as the growing expense of fossil fuels, internationalized industrialization of market, the outsourcing and privatization of national industries etc.) such traditional industry and income has diminished, causing community identities to fade.

Many coastal communities have similar traditional identities; Portsmouth for its naval associations and a number of other towns for their seaside tourism industries (Bournemouth, Weston-Super-Mare, Blackpool, Southend etc.), with the majority of coastal communities being involved with the fishing industry in one way or another. Again, for a number of reasons, the majority of coastal communities have lost their distinct traditional identities based on their industrial specialities.

Dalby and Mackenzie (1997, p.102) emphasise this theme of commonality as a foundation for community identity in bringing groups of people together against a common foe:

> "Symbols of community identity present a front of homogeneity vis-a-vis the other, a 'commonality', a necessary strategic resource in the face of perceived danger."

This sense of a united local opposition to an 'alien' threat which interferes with communal interests, is particularly evident in local opposition to the granting of planning permission for wind farms. Potential threats of audio and visual disturbances are prime sources of resistance.

Dalby and MacKenzie argue that labels such as NIMBYism and the presumption of a 'deficit model' for negative public responses to planning applications, lead to such responses often being associated with a mere 'token of defiance' against a threat. They state that such a threat could be perceived as potential re-articulations of the community's constitution, influenced by outside sources which they do not understand or which they fear.

However, recent reports have emerged underlining that contemporary coastal communities are facing a number of significant 'threats' to their populations, with diminishing employment opportunities, health and income indicators all contributing to the widening economic gap between coastal and non-coastal communities. One recent study (Corfe, Social Market Foundation, 2017) highlighted a number of serious issues threatening the health and well-being of coastal communities. It demonstrated the widening economic gap between coastal and non-coastal communities, with economic output (GVA) per capita increasing from 23 per cent lower in coastal communities compared with non-coastal communities in 1997, to 26 per cent in 2015.

Also, in 2016, 10 of the bottom 20 local authorities in terms of economic output per head (GVA) were in coastal communities, with 85 per cent of local coastal authorities overall having mean pay levels below the average across the UK. At the same time, five of the 10 local authorities in the UK with the lowest average employee pay, are identified as coastal communities. Unemployment rates were similarly poor; in March 2017, five of the top 10 local authorities with the highest rates of unemployment were coastal communities: Hartlepool (11.0 per cent), North Ayrshire (10.8per cent),

Copeland (9.6 per cent), Torridge (9.4per cent), Hastings (9.3 per cent) and South Tyneside (9.1per cent).

Health problems were also highlighted as being more prevalent in coastal communities. Of the 20 local authorities in England & Wales with the highest proportion of individuals in poor health, 10 are in coastal areas. However, it may be worth noting that some coastal communities (e.g. Bournemouth and Bognor Regis) have a higher than average percentage of people over 65, which could contribute to their higher than average result.

These threats to a community's social well-being result in a reduction in resistance to 'disruptive developments' such as offshore wind farms, which might oppose their traditional values. Resistance is reduced by the provision of security against such threats for the community (Crist and Routledge, 1994; Routledge,1996). Social anthropologist Anthony Cohen reiterates this, stating that community identities are mobilised and strengthened around a set of 'symbols', from which people 'make meanings' (Cohen,1985, pp15-19). Thus an energy source with distinct community focussed benefits could provide opportunities for that community, in the same way as the coal mines of Wales or steel mills of Sheffield.

Alice Mah (2012) analyses the impacts of de-industrialization on a number of communities within the U.S., UK and Russia. She uses these to demonstrate how industrial decline has led to widespread socio-economic polarization, resulting in the uneven growth of social and economic deprivation, depopulation, unemployment, the dilapidation of housing stock, and weak levels of infrastructure and service provision.

Mah also highlights the potential for the transferability of residents' skills acquired from traditional industrial employment, into the offshore wind sector. In doing so, this

> "has the potential to bring a new source of pride for work" for such a region which is suffering injustices as a result of decline (Mah, 2012. P.146)

Mah's research particularly illustrates the common theme of community bonding and cohesion amongst de-industrialized regions being tied to their working-class history. Regenerating such an area would need to address this:

> "The issues of employment opportunities, skills retention, and skills training within the local community need to be addressed in any plan that would impact redevelopment" (Mah, 2012. P.188).

Therefore, by basing a regeneration process of an area on forms of values recognizable to the local community, this would enable a smoother transition for the community, supported by improved socio-economic benefits.

Nasrul Islam's research (2015) highlights direct correlations between regional deprivation in the forms of income and wealth inequalities, and greater negative impacts on levels of environmental sustainability and biodiversity. He identifies a number of 'channels' that provide opportunity for such inequalities to manifest and produce environmental impairments upon a prospective community, namely: (i) household, (ii) community, (iii)national, and (iv) international.

From a household channel perspective, Islam utilises the case study of intra-country household income variations in Canada, to identify the importance of reducing socio-economic polarization in order to provide greater environmental protection. He also identifies that nations with a greater level of income and wealth inequality, have a higher per capita ecological footprint than those countries with a lower level if

inequality (Islam, 2015, p.8). Simultaneously, Islam raises the argument that poverty actually increases environmentally destructive behaviours, for example during a household's quest to meet their fuel needs. As highlighted in the previous chapter which discussed growing levels of fuel poverty, UK statistics showed that on average. low-income households actually spent more on heating their homes in comparison with higher earning households. One significant reason highlighted, was the lower-income household's inability to improve their home's heating efficiency levels (be this through lack of affordability or lack of opportunity due to restricted tenancy conditions). There are on-going benefits associated with implementing a project which both increases income from employment and makes affordable and efficient clean energy available. These reduce the community's harmful consumer behaviours and improve socio-economic justice levels for the region on both a static and dynamic basis.

From his community channel perspective, Nasrul Islam highlights the way in which inequality can adversely affect the levels of social justice within a community. This can become an obstacle during the decision-making process, when attempting to address the protection of a community's common property resources (CPR):

> "Higher inequality hinders crystallization of a common purpose and creates a trusting relationship among the community members" (Islam, 2015. p14).

Overexploitation of natural resources may result in inequality amongst the CPR users. This impedes the effective operation of regulation strategies to enable the equal enjoyment of all users (Baland and Platteau, 1999). Other academics such as Garret Hardin (1968) also claim that the greater the access to a CPR, the greater the risk of overuse and exhaustion of the commodity. However, by using a readily available non-

exhaustive product such as wind energy, a community could avoid the risk of product exhaustion whilst strengthening the protection of other CPRs from overexploitation.

Further inequalities created within the national channel, also strengthen the argument for using a decentralised autarkic energy system. This can introduce improved forms of socio-economic justice to a region, reversing the growing trend of inequality within the UK. Nations with greater levels of household inequalities, tend to produce higher levels of an ecological footprint per capita in comparison with similar affluent countries. A similar trend is demonstrated in relation to a nation's greenhouse gas (GHG) emissions. For example, between 2010 and 2014, Canada (where the income of the top 10 per cent of the population was 9.4 times greater than the income of the bottom 10 per cent) had an annual per capita CO_2 emission of 14.1 tons, whereas Sweden (whose income inequality difference between the top and bottom 10 per cent was a ratio of 6.2) had an annual per capita CO_2 emission level of 5.5 tons during the same period (Dorling,2010).

Furthermore, as Nasrul Islam (2015) highlights, despite general policy decision-making rationale being based upon 'benefit cost analysis' rule (BCA) – where preferences of all affected citizens of a nation are to be given equal weight – it is argued that the preference of more affluent group members is given more weight during the decision-making process. Boyce et al. (2007) reiterate this when introducing what they call the 'power-weighted social decision rule' (PWSDR). According to the PWSDR, the predominant policy will usually be the one that maximizes the sum of the power-weighted net benefits, rather than the net benefit of the majority under the BCA. Worryingly for conservation purposes, it is argued that in correlation with the PWSDR, the rich do not value the environment as highly as the rest of society. Evidence suggests

that their material interests are more aligned with environmental-damaging policies (Mikkelson et al. 2007).

This is reflected within the social conflict theory perspective, under which it is argued that within a society lies a state of perpetual conflict due to competition for limited resources. By suppressing the poor and powerless, the rich control the mechanisms which enable their control to continue and prolong the subordination. As such, the likelihood of a national wide environmentally-friendly policy being adopted would be severely reduced, especially as the more affluent members of a society can afford to insulate themselves from potential environmental harm that may arise as a result of policies resulting in environmental harm (Dorling, 2010).

Therefore, implementing a clean energy framework model in a region particularly affected by a shared common experience of inequalities, could reduce the risk of obstacles arising from conflicting interests under the premise of the PWSDR. This would improve the likelihood of achieving a common consensus which favours alleviation of the forms of poverty suffered by that region, whilst protecting its environmental resources and improving the residential environment. Implementation could then help in adjusting social consumption patterns on all levels, to reduce the inequalities discussed above and to better promote sustainable consumption throughout the region (United Nations, 2013). This could then be replicated in other areas of the UK. As a result, there are calls for greater top-down support to increase the number of locally sourced energy projects, mobilising the traditional characteristics of specific communities, promoting high levels of local involvement and distributing the benefits from such projects (Slee, 2015; Walker and Devine-Wright, 2008).

5.7 Lessons from Samsø

Other European countries have already demonstrated governmental support for local-level energy projects which address issues of unemployment and rural development problems. These provide key evidence on how to implement them with high levels of efficiency. Denmark shares similar geographical characteristics with the UK, and uses these to support the implementation of wind farms for the transitional shift from a reliance on fossil fuel to renewable energy (Klassen et al. 2005) Recognised as the global leader in clean energy transition for a significant number of years, the Danish tradition of support for such projects is based upon 'innovative democracy' (Hvelplund, 2014). This democratic foundation has been identified as a means to providing a better environment for facilitating community engagement and acceptance, through increased numbers of local cooperatives owning and operating such energy projects (Sperling, 2017).

One Danish case study recognised internationally as a leading example of such an effective and beneficial localised energy project, is that of the island of Samsø. The project was implemented across the island within a ten-year timeframe, spanning the entire community's energy sectors (heat, electricity and transport). Despite the established principle of Danish projects utilising local members of the communities within energy projects, Samsø is regarded as a pioneering case study for implementing a renewable autarkic energy framework. The Samsø Project demonstrated how such a relatively speedy transition of its energy system from fossil fuels to renewable energy sources can be achieved, to the direct benefit of the local community.

A major factor for the selection of Samsø as a ‘renewable energy island’ under a nationwide competition overseen by the country's Ministry of Environment and Energy (MEE), was the presence of a pre-existing sense of communal engagement with a range of regional issues. This was deemed by the MEE to be a vital requirement for any successful applicant entering the competition. This was because the ensuing project was to be based on a 'strong local engagement' amongst the local citizens and organisations as the project would be primarily under local ownership and control (MEE, 1997).

The Samsø project created large numbers of intragenerationally-focussed job opportunities for the local community, aiding in both restricting the emigration of the local workforce for the foreseeable future, and maintaining capital flow within the community. Before the system was constructed, the Samsø Energy Company and Samsø Energy and Environment Office undertook several information campaigns directed at raising awareness of the need for improved energy efficiency throughout the region. Locally based renewable energy advisors and utility companies were enlisted to provide special rates for visits to assess the efficiency levels of households and advise on optional methods for improvement (Sperling, 2017).

Local tradesmen received training during the early stages of the project, certifying them to install renewable forms of heating systems throughout the community. This boosted qualifications and skill sets thus improving trade (Jørgensen et al. 2007). Such community-sourced employment continued throughout both construction and operation, effectively keeping capital circulating within the regional economy whilst negating the need to spend increased amounts on externally sourced labour and materials (Jørgensen

et al. 2007). The prioritization of regional employment was encouraged by centralised Danish national guidelines which support flexible regional growth and devolution of powers within renewable energy (MEE, 1997).

During construction, further efforts were made to secure community interests throughout the renewable system's operation, through the implementation of a 'local wind power purchase model'. This ensured the equal distribution of financial benefits of the completed system. This was achieved by making the benefits from each turbine granted planning permission within the region, available to every inhabitant of Samsø, regardless of the ownership of the land used for development. For example, for every successful application made by a farmer to build a wind turbine on their land, they would have to agree to a second, cooperatively owned turbine installed also under the local wind power purchase model, for the other interests of all other community residents (Späth and Rohracher, 2010).

Furthermore, seven of the ten offshore wind turbines are owned and controlled from within the Samsø region. Five are owned by 'Samsø Havvind A/S', a municipality-owned limited company, and two are owned by local cooperatives. This demonstrates further direct benefits to the region in a number of ways, including increased levels of regional employment, serious focus on local inclusion in the operation of the renewable system and a wide distribution of benefits throughout the community.

5.7.1 Potential Methods for Improving Intergenerational Participation in the UK

The ‘renewable island’ of Samsø is an effective case study in the development of a regional community's energy sustainably. It highlights that the benefits of an autarkic energy subsystem are not limited to the primary and secondary resources of fuel within the region. It also shows that providing greater opportunities of intergenerational participation throughout the local community, is of great importance to improving social aspects of sustainable development.

Arguably, a number of these framework characteristics can be transferred and utilised in other regional subsystems, to improve their levels of sustainable development. One example of this is the deliberate distribution of employment opportunities (when possible) within the regional community. Jobs associated with the construction, installation and operation of a wind farm energy subsystem, when implemented in a similar method to Samsø, could provide a coastal region of the UK a mitigation for falling socio-economic and employment rates (Corfe, Social Market Foundation, 2017). This is especially true when paired with the growing risks of adverse climate change which will impact the health and well-being of those communities (Depledge et al. 2017).

Supporting a greater reliance on energy resources from within a region, wind-power provides a locally sourced product and service. The effect of this is to increase the capital income created within and for the benefit of the community. This in turn could lead to the reversal of growing unemployment levels and socio-economic suffering, by

improving the affordability of good living standards, such as energy affordability and residential efficiency-improvements.

Prospective communities choosing to utilise this autarkic framework, could also improve inter-generational levels of awareness and contributions to sustainable development. As part of the process to become a beacon for regional renewable energy, Samsø created the Energiakademiet ('the Energy Academy') which acts as the island's own information and education centre (Energiakademiet.dk). Whilst working to highlight various aspects of sustainable development throughout the municipality, it also provides varied educational opportunities for visitors. Not only is it used as the central office for a number of the region's energy departments, but it is used as a research centre. Both Danish and foreign educational institutions research energy projects from the academy, with vital direct access to the island as working program model. The centre also provides energy advice for companies and private tours, guided tours, workshops and seminars, all of which work towards securing greater levels of sustainable developments.

Having such a centre also enhances the local tourism trade for Samsø, as the Academy receives over 5,000 visitors per year. These include politicians, ambassadors, officials, journalists, school classes and private individuals. Should such a centre be established within the UK, it would not only be the first of its kind on these shores, but it would be likely to have greater visitor numbers than the centre in Denmark, due to the UK's larger population. It would also substantially contribute to the chosen region's annual income from tourism.

In tandem with such an academy, another potential benefit could be improved educational prospects for younger members of the community, through the region's schools, colleges and universities. By offering cross-educational/employment schemes specifically designed for the growing wind energy sector, the region could significantly improve the current and future employment prospects and skillsets of its younger inhabitant-generations through the use of the working project. Apprenticeship schemes and degrees could be designed to focus on various aspects of the planning, construction and operation of offshore wind projects. For example, planning administrators and managers would be required for the pre-installation processes. From an architectural perspective, courses and qualifications could be designed for engineers, mechanics etc., in addition to skilled labourer opportunities being available through the construction and maintenance of the wind farm project and energy subsystem. From a business perspective, employment courses can be developed in the specialised field of wind energy operations.

The introduction of such courses designed with practical modules and application to an on-site energy subsystem would also provide benefits to the educational institutions involved. The courses would attract a large number of potential students wishing to undertake them, with valuable practical learning opportunities available as part of the courses. Increasing numbers of courses would increase the income from tuition fees, whilst the appeal of specialised courses would be in part due to the first-hand experience that could be gained. They would provide a significant incentive to joining such a university/school. This appeal could enable a university to attract top performing students in a number of fields, which would not only contribute to the university's

performance in league tables but also reduce levels of annual marketing expenditure which would otherwise being spent in remaining 'competitive' with other universities.

5.7.2 Co-Ownership Advantages

The Danish energy system works demonstrates that effective progression in wind energy based sustainable development, can be achieved through the utilization of a bottom-up approach which uses cooperative ownership models. As demonstrated by such models, key aspects such as economic and social development, can be significantly improved with renewable energy systems for the benefit of various parties.

One of the most significant case studies for an effective co-ownership scheme is demonstrated by the Middelgrunden Offshore Wind Farm in Denmark, where 50 per cent of the project’s value is owned by citizen shareholders through the Middelgrunden Wind Turbine Cooperative. This Cooperative consists of 8,553 members, many of whom are residents. The wind farm consists of twenty 2 MW turbines and at the time of completion in 2000, was the world's largest offshore wind farm (Larsen et al. 2005). It serves to highlight the way in which a co-ownership model not only provides financial benefits to the local community, but also demonstrates harmonisation of the sustainable development of such a project.

Using a co-ownership model for an offshore wind energy subsystem as demonstrated by the Middelgrunden Cooperative, could provide significantly improved levels of sustainable development which benefits the end users. For example, from the viewpoint of a local resident, by pooling resources with other residents to build a larger, locally

focussed subsystem, not only would the individual resident benefit from the economies of scale, but the economic feasibility of such a project would be increased, thus strengthening the security of the resident's investment (Bauwens et al. 2016).

In addition, whilst securing finance for a wind project could be seen as a potential barrier to development due to potential risk for investors and project developers, cooperatives are well suited for ensuring the financial viability of small(er) projects using local sources of financial backing. These can include local fund raising and local entrepreneurs, which are more suitable options when compared to other models that are more reliant on loan schemes and grants (Bauwens et al, 2016).

Furthermore, cooperatives across Europe benefit from a number of funding support mechanisms, such as feed in tariffs (FiTs) etc. Academic argument suggests that through the use of such mechanisms, locally-owned cooperatives are the most likely to profit from decentralized systems, as they would keep both transaction costs and operation costs down. This would be achieved as the end-user point would be shortened and more direct, lowering the cost of the potential risk generated by the subsystem (Mitchell et al, 2006). Through a cooperative ownership model, the associated support mechanisms would provide high investment security for the local community as investors through these lowered transaction costs and the introduction of more predictable cash flows (Courture and Gagnon, 2010). However, it is worth noting that historical evidence from Denmark highlights the changing national policy frameworks which initiated the progressive phasing out of FiTS during the early 2000s. This caused a stark decrease in the percentage growth of capacity in the Danish wind sector (IEA-

RETD, 2016) along with a general shift in levels of government support for community owned wind projects (Meyer and Koefoed, 2003).

From a social perspective, the benefits of a co-ownership approach can include improvements in of procedural justice, benefiting both the local community and planners. Such decentralized co-ownership systems provide the local community with stronger and more meaningful opportunities to participate in the decision-making process (MacArthur, 2013). From the viewpoint of the developer, the chances of having planning consent granted are improved by the more meaningful participation of the community during the planning stages. (McLaren Loring, 2007). As Toke et al. identified, local ownership contributes to overcoming negative attitudes towards wind farm projects, because it helps to create "significant local networks supporting wind farm developments" (2008, p.1144).

A co-ownership scheme can also improve procedural justice during the subsystem's operating timeframe, as the level of end user management throughout its operation promotes both ownership and management from a bottom-up perspective (Huybrechts and Mertens, 2014). As demonstrated by the Danish co-ownership models, it reinforces equality of voting rights on decision making processes. Each shareholder would hold equal voting rights whilst avoiding obstacles to new members, allowing the governance structure to accurately reflect the interests and needs of each shareholder. Similarly, allocation of net income as a return on dividends is capped, demonstrating that the primary objective of such co-ownership schemes, is to provide a fair and equal distribution of return, rather than simple maximisation of profit (Bauwens et al, 2016).

Furthermore, relatively recent changes in Danish regulations introduced by the Promotion of Renewable Energy Act 2009, have placed a mandatory obligation to offer for sale at least 20 per cent of the turbine ownership shares to the local residents prior to the commencement of erection (Section 13 (1)). Prior to the introduction of the Renewable Energy Act 2009, there was no mandatory percentage of local shareholders. This further demonstrates the strengthening of centralised Danish government's attitude to shareholder ownership, deviating from a focus of a traditional generic open-market principle to one supporting direct community benefit. Such cooperative models enable smaller participating groups and communities to have greater influence in evolving policy strategies in light of increasing power market competition, which may not otherwise truly reflect the interests of local individuals (Bauwens et al. 2016, p146).

5.7.3 Replication in the UK

In the UK, a few case studies demonstrate attempts to replicate either co-ownership models or total community ownership models of wind farms, with the majority being onshore. One case study is the Westmill Wind Farm in Oxfordshire, which is the first fully community-owned wind farm in the UK. It consists of five 1.3 MW turbines which supply 2,500 average homes with renewable generated electricity. (Westmill Coop, 2008). Another case study demonstrating a similar co-ownership model, is based on the Scottish island of Gigha. The Heritage Trust set up Gigha Renewable Energy Ltd. (GREL) to purchase, install and operate three VESTAS V27 turbines (more commonly known among the locals as 'the dancing ladies') on the island in 2004. This was the first community owned wind farm in Scotland, and due to the successful installation and operation of the original 'dancing ladies', GREL installed a fourth

Enercon E33 turbine in 2011. This is currently managed by the Gigha Green Power Limited (GGPL) and became operational in 2013. Both the V27 and E33 turbines were accredited through separate funding support mechanisms (the UK's Renewable Obligation Certificate Scheme and FiT Scheme respectively) but both pass profit from sales of power to the Isle of Gigha Heritage Trust, which maintains and improves the island.

Evidence from these case studies demonstrates similar benefits to those derived from the Danish projects. Most notably, public attitudes are more positive towards wind farm developments in areas where local communities have a greater level of direct involvement in the ownership and operation of such developments, than in areas where they do not (Warren and McFadyen, 2010). Similarly, Warren and McFadyen highlight that the introduction of more community ownership models could work to amplify 'pre-existing positive attitudes and suppress the negative ones', throughout the development of wind power projects in the UK.(Ibid, p 211) Such a model could therefore assist with the implementation a paradigm shift away from the traditional capitalistic interests of the British energy systems, towards more citizen involvement. In this model, where the population are currently only regarded as generic end-point consumers from a top-down perspective, they would become more conscious 'prosumers', with each individual in a community having greater democratic involvement with the energies they consume (Bauwnes et al. 2016; Schoor et al.2016).

5.8 Improving Energy Justice Through Transitioning of Heating Systems

Whereas the rate of connection to the electricity transmission and distribution systems is extensive in Europe (mostly 100 per cent) (Worldbank.org, 2018), heat is not typically transported over large distances. Whilst designing a model to convert current heating system practices into low/zero emission systems is beyond the remit of this research, one theoretical option could be the implementation of a district wide residential heating system supported by a decentralized energy grid as discussed above.

Where centralized systems are often illustrated by a linear distributed flow of energy through transmission and distribution, a decentralized energy system is characterised by larger numbers of smaller generating plants and owners/operators. The latter is traditionally comprised of more integration between various energy forms (e.g. electricity, heat and gas).

Recent studies show that in test scenarios where potential renewable energy generation and electrical storage have been designed to operate on a large scale (such as on a community scale), the costs of such systems are more efficiently optimized by generating excess electricity, rather than being designed to purchase or store more electricity (Pensini et al. 2014). As such, any excess energy generated could be re-focussed in heating systems such as district heating (Budischak et al. 2013). Those based on heat pumps, would provide lower costs and significant potential CO^2 reductions (Pensini et al.2014).

Some emphasise that the achievement of UK specific CO^2 reduction targets via the use of heat pumps, would only be achieved if the UK electricity supply were to be de-carbonised at the same time (Gupta and Irving, 2014). Research demonstrates that the

use of individual heat pumps in large numbers can support such a requirement through the cost-effective integration of wind power (Hedegaard et al. 2012). This significantly reduces system operating costs, contributing to greater investment in wind power (Hedegaard and Münster, 2013). Further research demonstrates that by utilizing electrically driven heat pumps in a district heating network, efficiency can be further optimised. Bach et al. (2016) highlight this using the Greater Copenhagen district heating system as a case study. Supporting an area over 1,700 square miles populated by over one million people, their case study found that by connecting heat pumps to district heating distribution networks, this resulted in a significantly higher heat production and output.

This is restated by Østergaard and Andersen (2016), who identify that by using a combined district heating and heat pump model, improvements in the system's coefficient of performance can be increased to as much as 10, whilst significantly lowering the district heating system's grid losses and annual operating costs. Such benefits could therefore improve levels of energy justice amongst all households involved, whilst significantly reversing the growing number of UK households that are vulnerable to fuel poverty. Combining improved energy efficiency and overall reduction of energy costs, this would enable households to spend a smaller proportion of their income on heating.

Recent UK policies would particularly benefit from community wide combined heat and energy and district heating system models. In 2014, the Department of Energy and Climate Change (DECC) introduced its 'Community Energy Strategy' (2014) to promote more community energy generation projects, making specific reference to social

housing (DECC, p. 9). Furthermore, the recent Housing and Planning Act 2016 promotes home ownership and boosts the levels of affordable social house building in England. By creating affordable housing that would be more energy and cost effective for the private or social renters, it would allow individuals a greater opportunity to redirect the income otherwise spent on energy, towards purchasing their own property. Simultaneously it would benefit local councils, as whilst meeting obligations under the Housing and Planning Act, utilising such models in local housing estates could reduce council expenditure in both operation/maintenance costs and centralised financial support benefits under the Government's implemented Energy Strategy. Local councils could further benefit from such financial gains, by reinvesting the saved expenditure into various local community improvements.

The case study of Brixton Energy demonstrates how such profits from a renewable energy subsystem can be symbiotically distributed (McCabe et al. 2018). The co-operative based in South London, applied solar photovoltaics (PV) to three developments within a social housing estate. Once profit has been distributed to share interest, it reinvests part of the income from the PV installations into a 'Community Energy Efficiency Fund'. This benefits the council and local community in several ways including increased local energy resilience and security, funding of training, employment of local people and funding community events and workshops (McCabe et al. 2018; Brixton Energy 2018).

Conclusion

This research has illustrated the historical evolution of the definition of sustainable development and has described how this has resulted in a range of interpretations within contemporary sustainability. This resulted in the emergence of discussion surrounding the importance of Brundtland's three individual principles or 'pillars' under his popular definition of sustainable development, and the importance of each within national and regional policies protecting them. The virtue of 'justice' as an overarching feature of contemporary sustainable development, provides a remedy for such conflicting interests, and acts as a means of applying more holistic sustainable development.

This research highlights the ways in which the rights of nature are currently being devalued within society, for relatively short term economic gain. This demonstrates direct contradiction of the environmental pillar of Brundtland's definition. Environmental Impact Assessments are the main method implemented to balance the needs of nature and contemporary industrialization. However uncertainty continues regarding their effectiveness in achieving the desired results of sustainability, specifically in relation to implementing greener sources of energy through the use of offshore wind farms.

Problems such as the ambiguous language used within the statutory definition of EIAs – especially when read with other pieces of legislation such as the Habitats Directive and

the Birds Directive – create uncertainty when attempting to calculate the level of impact of development upon the natural environment. This renders it more difficult to determine the level of (in)justice received by nature and to measure whether a potential project could be deemed truly sustainable. Continued differences of interpretation will therefore complicate the prediction of planning consent success. This will lead to failed applications, increasing financial and time costs for planners. As a result, a clearer, definitive assessment is needed in national policy, when evaluating ecological impact by NSIPs. This would reduce uncertainty within planning applications, as they would be supported by the increased consideration and evaluation of ecologically favoured strategies, when designing and implementing energy projects.

The review and analysis carried out as part of this research, highlight key issues from both top-down and bottom-up perspectives involved with the application of environmental justice within the energy sector. This has involved the examination of a range of components from academic definitions of environmental justice theory. Evidence suggests that there is a growing trend within the UK, of compounded environmental injustices arising within coastal communities, when attempting to achieve sustainable development goals. Injustices such as inadequate or totally lacking individual and/or community involvement, during the procedural and administrative phases of the planning and implementation stages of nationally significant offshore infrastructure projects.

Additional evidence demonstrates that current national and regional energy policies are producing increased numbers of households qualifying as fuel poor, due to increasing costs of energy bills coupled with outdated and inefficient residential heating systems.

Furthermore, not only are the numbers of households falling into fuel poverty increasing, but the gap between those who are and are not deemed as fuel poor is becoming larger. This creates greater social divisions of inequity throughout the UK, whilst the benefits of energy infrastructures are limited to a privileged minority of society.

Theoretical analysis provided by this research, supports the introduction of a regional energy subsystem, supported by a conceptual framework of energy autarky. This demonstrates how in coastal communities suffering from a wide range of disadvantages (including social and economic deprivation, depopulation, unemployment, dilapidated housing, weak levels of infrastructure and service provisions as a result of de-industrialization), the growing trends of environmental, energy, and social injustices could be reversed, whilst directly contributing towards the UK's national CO_2 reduction targets.

Evidence of projects implemented in Denmark, demonstrate how such autarkic framework-based wind projects can significantly improve regional levels of sustainable development, on both an intergenerational and intragenerational basis. Furthermore, those projects utilizing some form of cooperative ownership model demonstrate how economic and social development can be significantly improved on a community level.

The additional achievement of improved regional sustainable development could be provided through such a framework, by implementing floating wind turbines instead of fixed monopole turbines. This would eliminate threats to marine biodiversity from the installation and decommissioning processes traditionally associated with the latter. As

similarly highlighted, floating turbines also bring financial benefits to developers through potential savings on the time and costs usually associated with monopole wind farm construction.

However, despite the theoretical advantages highlighted within this research, the lack of existing research into any community-owned NSIP, suggests that their actual contributions towards a more cohesive form of sustainable development, will be difficult to assess. Arguably, such a project would warrant greater attention on the basis of its potential reward. Further research is necessary in order to draw clearer conclusions. This would potentially involve a series of monitoring programmes during a time frame before, during and after installation of such a NSIP which is subject to the co-ownership model. This would assess its genuine viability using the community as a test subject and could provide the foundations for the design of a framework capable of achieving better levels of sustainable development than ever before.

Reference List

Abram, N., McGregor, H., Tierney, J., Evans, M., McKay, N. and Kaufman, D. (2017). Corrigendum: Early onset of industrial-era warming across the oceans and continents. *Nature*, 545(7653), pp.252-252.

Adger, W. (2001). Scales of governance and environmental justice for adaptation and mitigation of climate change. *Journal of International Development*, 13(7), pp.921-931.

Adler, N. (2000). An international perspective on the barriers to the advancement of women managers, *Applied Psychology: An International Review*, 42, pgs. 289–300

Agyeman, J. and Evans, B. (2003) Just sustainability: The emerging discourse of environmental justice in Britain. *The Geographical Journal* 170(2):155–164

Aitken, M. (2010). Why we still don't understand the social aspects of wind power: A critique of key assumptions within the literature. *Energy Policy*, 38(4), pp.1834-1841.

Alcamo, J. Campbell, B.M. Luckert, M.K. Mutamba, M. (2003) Ecosystems and Human Well-being: A Framework for Assessment. A Report of the Conceptual Framework Working Group of the Millennium Ecosystem Assessment [MA]. Island Press. Available at: http://www.millenniumassessment.org/documents/document.356.aspx.pdf

Allen, R. (2009). *The British Industrial Revolution in Global Perspective*. Cambridge: Cambridge University Press.

Alston, D. and Bullard, R. (1990). *We speak for ourselves*. Washington, D.C.: Panos Institute

Ambrose, A. McCarthy, L. and Pinder, J. (2016). Energy (In)Efficiency: what tenants expect and endure in private rented housing. Final Report. [online] Sheffield: Centre for Regional Economic and Social Research. Available at: https://www4.shu.ac.uk/research/cresr/sites/shu.ac.uk/files/energy-inefficiency-private-rented-housing-final-report.pdf

Arnstein, S. (1969) A Ladder of Citizen Participation. *Journal of the American Planning Association*, Vol. 35, No. 4, pp. 216-224

Ascough, J., Maier, H., Ravalico, J. and Strudley, M. (2008). Future research challenges for incorporation of uncertainty in environmental and ecological decision-making. *Ecological Modelling*, 219(3-4), pp.383-399.

Atkins, P. (2010) *The Laws of Thermodynamics: A Very Short Introduction.* Oxford University Press. ISBN: 9780199572199)

Ayres, R.U.; van den Bergh, J.C.J.M.; Gowdy, J.M. (1998) *Viewpoint: Weak versus Strong Sustainability*; Tinbergen Institute Discussion Papers; Tinbergen Institute: Amsterdam, The Netherlands; pp. 98-103.

Bach, B., Werling, J., Ommen, T., Münster, M., Morales, J. and Elmegaard, B. (2016). Integration of large-scale heat pumps in the district heating systems of Greater Copenhagen. *Energy*, 107, pp.321-334.

Baland, J. and Platteau, J. (1999). The Ambiguous Impact of Inequality on Local Resource Management. *World Development*, 27(5), pp.773-788.

Band, W., (2011). *Using a Collision Risk Model to Assess Bird Collision Risks for Offshore Windfarms*. SOSS Report, The Crown Estate, London. http://www.bto.org/science/wetland-and-marine/soss/projects
Barnes, M. Butt, S. & Tomaszewski, W. (2010). *The Duration of Bad Housing and Living Standards of Children in Britain.* Housing Studies, 26(1), pp. 155-176. doi: 10.1080/02673037.2010.512749
Barry, J. (1996). 'Sustainability, Political Judgement and Citizenship: Connecting Green Politics and Democracy' in B. Doherty and M. de Geus (eds), *Democracy and Green Political Thought – Sustainability, Rights and Citizenship*. London: Routledge
Bartelmus, P. (1986). *Environment and development*. Boston: Allen & Unwin.
Bauwens, T., Gotchev, B. and Holstenkamp, L. (2016). What drives the development of community energy in Europe? The case of wind power cooperatives. *Energy Research & Social Science*, 13, pp.136-147.
Bell, D., Gray, T. and Haggett, C. (2005). The 'Social Gap' in Wind Farm Siting Decisions: Explanations and Policy Responses. *Environmental Politics*, 14(4), pp.460-477.
Bevan, T. Actuanza, J. Feldman, S. Tweet, E. (2006). Addressing Sustainability for Major Transportation Projects: Seattle Mercer Corridor Case Study. *Proceedings of the 83rd Transportation Research Board Annual Meeting*. Washington, D.C.: Transportation Research Board.
Birnie, P.W, Boyle, A. and Redgwell, C. 2009. International Law and The Environment. 1st ed. Oxford: Oxford University Press.
Blackaby, D. (2002). White/ethnic minority earnings and employment differentials in Britain: evidence from the LFS. *Oxford Economic Papers*, 54(2), pp.270-297
Boardman, B., Bullock, S., McLaren, D. and Meacher, M. (1999). *Equity and the environment: Guidelines for Green and Socially Just Government*. London: Catalyst with Friends of the Earth.
Boddice, R. (2011). *Anthropocentrism: Human, Animals, Environments*. 1st ed. Leiden: Brill.
Bohnsack, J.A., Sutherland, D.L., (1985). Artificial reef research: a review with recommendations for future priorities. *Bull. Mar. Sci*. 37, 11-39
Boyce, J.K., Narain, S., & Stanton, E.A., (2007). *Reclaiming Nature: Environmental Justice and Ecological Restoration*. London. Athem Press
Boyd, J. and Banzhaf, S. (2007). What are ecosystem services? The need for standardized environmental accounting units. *Ecological Economics*, 63(2-3), pp.616-626.
Brechin, S., Wilshusen, P., Fortwangler, C. and West, P. (2002). Beyond the Square Wheel: Toward a More Comprehensive Understanding of Biodiversity Conservation as Social and Political Process. *Society & Natural Resources*, 15(1)
Brixtonenergy.co.uk. (2018). *Brixton Energy | Power to, for and by the people!.* [online] Available at: https://brixtonenergy.co.uk/
Broekel, T. and Alfken, C. (2015). Gone with the wind? The impact of wind turbines on tourism demand. Energy Policy, 86, pp.506-519.
Brulle, R.J. (2000). *Agency, Democracy and Nature: The US Environmental Movement from a Critical Theory Perspective*, Cambridge, MA and London: The MIT Press
Brundtland, G.H. World Commission on Environment and Development, *Our Common Future* (Oxford University Press 1987)
Budischak C., Sewell, D., Thomson, H., Mach, L., Veron, D.E., Kempton, W. Cost minimized combinations of wind power, solar power and electrochemical storage, powering the grid up to 99.9% of the time. *J Power Sources* 2013;225:60–74.

Bullard, R. (1999). Dismantling Environmental Racism in the USA. *Local Environment*, 4(1), pp.5-19.
Bullard, R. 'Environmental Justice in the 21st Century' in Dryzek, J. and Schlosburg, D. (2005) *Debating the Earth* (Oxford: Oxford University Press, pp.322–356.
Caldeira, K., Jain, A.K., Hoffert, M.I., (2003) Climate Sensitivity Uncertainty and the Need for Energy Without CO_2 Emission. *Science*, Vol. 299, Issue 5615, pp. 2052-2054
Campbell-Lendrum, D. and Corvalán, C. (2007). Climate Change and Developing-Country Cities: Implications For Environmental Health and Equity. *Journal of Urban Health*, 84(S1), pp.109-117
Carson, R. (1962). *Silent spring*. Boston: Houghton Mifflin ; Cambridge, Mass.: Riverside Press, Boston

Casten T.R. 'Recycling energy to reduce costs and mitigate climate change' In: McCracken MC, Moore F, Topping JC, Jr. (2008) *Sudden and Disruptive Climate Change: Exploring the Real Risks and How We Can Avoid Them*. London, UK: Earthscan;
Castro, J. J., Santiago, J. A. & Santana-Ortega, A. T. (2002). A general theory on fish aggregation to floating objects: an alternative to the meeting point hypothesis. *Reviews in Fish Biology and Fisheries* 11, 255–277.
Castro-Santos, L., Filgueira-Vizoso, A., Carral-Couce, L. and Formoso, J. (2016). Economic feasibility of floating offshore wind farms. *Energy*, 112, pp.868-882.
Catton, W. R. Jr and Dunlap, R. E. (1978). Environmental Sociology: A New Paradigm. *The American Sociologist*, 13: 41-9
Cavazzi, S. and Dutton, A. (2016). An Offshore Wind Energy Geographic Information System (OWE-GIS) for assessment of the UK's offshore wind energy potential. *Renewable Energy*, [online] 87, pp.212-228. Available at: http://file:///C:/Users/User/Documents/MRES/MRES%20Articles%20&%20Journals/Remedy%20Proposals/An%20Offshore%20Wind%20Energy%20Geographic%20Information%20System%20(OWE-GIS).pdf.
Chamberlain, D., Rehfisch, M., Fox, A., Desholm, M. And Anthony, S. (2006). The effect of avoidance rates on bird mortality predictions made by wind turbine collision risk models. *Ibis*, 148, pp.198-202.
Chan, K., Anderson, E., Chapman, M., Jespersen, K. and Olmsted, P. (2017). Payments for Ecosystem Services: Rife with Problems and Potential—For Transformation Towards Sustainability. *Ecological Economics*, 140, pp.110-122.
Chicco, G. Mancarella, P. (2009). Distributed multi-generation: a comprehensive view. *Renewable and Sustainable Energy Reviews* 2009;13(3):535–51
Chiesura, A. and de Groot, R. (2003). Critical natural capital: a socio-cultural perspective. *Ecological Economics*, 44(2-3), pp.219-231.
Christie, N., Smyth, K., Barnes, R. and Elliott, M. (2014). Co-location of activities and designations: A means of solving or creating problems in marine spatial planning?. *Marine Policy*, 43, pp.254-261.
Chowdhury, P. and Samuel, M. (2014). Artificial neural networks: a tool for understanding green consumer behaviour. *Marketing Intelligence & Planning*, 32(5), pp.552-566.
Clapp, B. (2014). *Environmental History of Britain since the Industrial Revolution, An*. Hoboken: Taylor and Francis.
Corcoran, H. and Smith, K. (2016). *Hate Crime, England and Wales, the Home Office, 2015/16*. [online] Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/559319/hate-crime-1516-hosb1116.pdf
Cohen, A. (1985) *The Social Construction of Community*. Tavistock,London
Cook, K. (2011). Biodiversity and climate change: some emerging legal issues. In: *Sustainable Development in an Age of Austerity*. [online] UKELA, pp.208 - 216
Cook, A.S.C.P., Johnston, A., Wright, L.J., Burton, N.H.K., 2012. *A Review of Flight Heights and Avoidance Rates of Birds in Relation to Offshore Wind Farms*. Crown Estate Strategic Ornithological Support Services. Project SOSS-02. http://www.bto.org/science/wetland-and-marine/soss/projects
Corfe, S. Social Market Foundation (2017). *Living on the edge: Britain's coastal communities*. [online] London. Available at: http://www.smf.co.uk/wp-content/uploads/2017/09/Living-on-the-edge.pdf
Council of Europe, PA, (1999) Future Action to Be Taken by the Council of Europe in the Field of Environment Protection, Text Adopted, Rec 1431; notably para 8Xx
Council of Europe, PA,(2003) Ordinary Sess (Third Part), Environment and Human Rights, Doc 9791, Rec 1614.
Council of Europe, PA, (2009) Ordinary Sess (Fourth Part), Drafting an Additional Protocol to the European Convention on Human Rights Concerning the Right to a Healthy Environment, Doc 12003, Rec 1885 at para 10
Couture, T. and Gagnon, Y. (2010). An analysis of feed-in tariff remuneration models: Implications for renewable energy investment. *Energy Policy*, 38(2), pp.955-965.
Cox, J. (2010). Beyond Frames: Recovering the Strategic in Climate Communication. *Environmental Communication*, 4(1), pp.122-133.
Crist, J. and Routledge, P. (1994). Terrains of Resistance: Nonviolent Social Movements and the Contestation of Place in India. *Contemporary Sociology*, 23(4), p.544.
Critchley, R., Gilbertson, J., Grimsley, M. and Green, G. (2007). Living in cold homes after heating improvements: Evidence from Warm-Front, England's Home Energy Efficiency Scheme. *Applied Energy*, 84(2), pp.147-158.
Crowther, T.W. et al. (2016) Quantifying global soil carbon losses in response to warming. *Nature* volume 540, 104-108
Dalby, S. and Mackenzie, F. (1997). Reconceptualising local community: environment, identity and threat. *Area*, 29(2), pp.99-108.
Data.worldbank.org. (2018). *Access to electricity (% of population) | Data*. [online] Available at: https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS
De Groot, R., Van der Perk, J., Chiesura, A. and van Vliet, A. (2003). Importance and threat as determining factors for criticality of natural capital. *Ecological Economics*, 44(2-3), pp.187-204.
del Rio, P., Burguillo, M. (2008). An empirical analysis of the impact of renewable energy deployment on local sustainability. *Renewable and Sustainable Energy Reviews*;13(6-7):1314–25.
Dempster, T. (2005). Temporal variability of pelagic fish assemblages around fish aggregation devices: biological and physical influences. *Journal of Fish Biology*, 66(5), pp.1237-1260.
Department for Business, Energy and Industrial Strategy [DBEIS] (2017). *Annual Fuel Poverty Statistics Report (2015 Data) (England)*. [online] Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/639118/Fuel_Poverty_Statistics_Report_2017_revised_August.pdf
Department for Business, Energy and Industrial Strategy [DBEIS] ((2018) *Annual Fuel Poverty Statistics Report, 2018* (2016 Data) England. National Statistics. Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/719106/Fuel_Poverty_Statistics_Report_2018.pdf
Department for Business, Energy & Industrial Strategy [DBEIS] (2017). *DUKES chapter 6: statistics on energy from renewable sources. Digest of UK Energy Statistics (DUKES): renewable sources of energy.* [online] Gov.UK. Available at: https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes
Department of Energy & Climate Change [DECC] (2009) *The UK Renewable Energy Strategy*, TSO, London, available at: *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf*
Department of Energy & Climate Change [DECC] (2011) Energy Trends June 2011 [online] ISSN 2040-6029 (Online). Available at: http://webarchive.nationalarchives.gov.uk/20130106091008/http://www.decc.gov.uk/en/content/cms/statistics/publications/trends/trends.aspx
Department of Energy & Climate Change [DECC] (2011a) UK Renewable Energy Roadmap 2011. Department of Energy and Climate Change.
Department of Energy & Climate Change [DECC] (2012). *Record Of The Appropriate Assessment Undertaken for Applications Under Section 36 Of The Electricity Act 1989*. [online] London: DECC. Available at: https://itportal.decc.gov.uk/EIP/pages/projects/AAGreaterWash.pdf and https://itportal.beis.gov.uk/EIP/pages/projects/DockingDecision.pdf
Department of Energy & Climate Change [DECC] (2012a) Development Consent Decision Letter. Available from: https://www.og.decc.gov.uk/EIP/pages/projects/DockingDecision.pdf〉; July 6 2012). [online] London: DECC. Available at: https://itportal.beis.gov.uk/EIP/pages/projects/DockingDecision.pdf
Department of Energy & Climate Change [DECC] (2014). *Community Energy Strategy: Full Report*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/275169/20140126Community_Energy_Strategy.pdf
Department of Energy & Climate Change [DECC] (2015). *Controlling the cost of renewable energy*. [online] Available at: https://www.gov.uk/government/news/controlling-the-cost-of-renewable-energy
Department of Energy & Climate Change [DECC](2015a). *Oral Statement by Amber Rudd, Secretary of State for Energy and Climate Change on ending subsidies for onshore wind*. [online] Available at: https://www.gov.uk/government/speeches/statement-on-ending-subsidies-for-onshore-wind
Department of Energy & Climate Change [DECC], Renewable Energy Focus, (2014) UK department of energy and climate change announces bold 'Community energy strategy', *Renew. Energy Focus* 15 (1)
Department of Energy & Climate Change [DECC] (2015b). *Digest of United Kingdom Energy Statistics 2015.* [online] London: National Statistics. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/450302/DUKES_2015.pdf
Department for Environment, Food and Rural Affairs [DEFRA] (2008). *The UK Fuel Poverty Strategy -6Th Annual Report*. Available at http://webarchive.nationalarchives.gov.uk/+/http:/www.berr.gov.uk/files/file48036.pdf

Department for Environment, Food, and Rural Affairs [DEFRA] (2013). *Payments for Ecosystem Services: A Best Practice Guide*. [online] London: DEFRA. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/200920/pb13932-pes-bestpractice-20130522.pdf

Depledge, M., Lovell, R., Wheeler, B., Morrissy, K., White, M. and Fleming, L. (2017). *Future of the Sea: Health and Well-being of Coastal Communities*. Government Office for Science.

Desholm, M., Kahlert, J., 2005. Avian collision risk at an offshore wind farm. *Biol. Lett.* 1, 296e298

Devine-Wright, P. (2010). Public engagement with large-scale renewable energy technologies: breaking the cycle of NIMBYism. *Wiley Interdisciplinary Reviews: Climate Change*, 2(1), pp.19-26.

Dietz, T., Fitzgerald, A. and Shwom, R. (2005). Environmental Values. *Annual Review of Environment and Resources*, 30(1), pp.335-372.

Dixon, W. and Wilson, D. (2012). *A history of homo economicus*. 1st ed. London: Routledge.

Dobson, A. (1998). *Justice and the environment*. Oxford: Oxford University Press.

Dodds, S., 1995 *Understanding sustainable development: A policy-oriented guide to the idea and its application*. CRES Working Paper 1995/1, Australian National University

Dorling, D. (2010*) Is More Equal More Green?* London: University of Sheffield. Available at: http://sasi.group.shef.ac.uk/presentations/rgs/

Dryzek, J.S. (1997) *The Politics of the Earth: Environmental Discourses* Oxford; New York: Oxford University Press.

Duinker, P. and Greig, L. (2007). Scenario analysis in environmental impact assessment: Improving explorations of the future. *Environmental Impact Assessment Review*, 27(3), pp.206-219.

Dunion, K. (2003) *Trouble Makers: The Struggle for Environmental Justice in Scotland*. Edinburgh: Edinburgh University Press

Ekins, P., Simon, S., Deutsch, L., Folke, C. and De Groot, R. (2003). A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics*, 44(2-3), pp.165-185.

Elliott, D. (1994) Public reactions to windfarms: the dynamics of opinion formation, *Energy and Environment*, 5, pp. 343–362

Energiakademiet.dk. *About us - Energiakademiet.dk*. [online] Available at: https://energiakademiet.dk/en/om-energiakademiet/

European Environment Agency [EEA], (2009) *Europe's Onshore and Offshore Wind Energy Potential: An Assessment of Environmental and Economic Constraints, EEA Technical Report No. 6*, European Environment Agency, Copenhagen.

European Wind Energy Association (EWEA) (2013). *Deep water: The next step for offshore wind energy*. [online] EWEA. Available at: http://www.ewea.org/fileadmin/files/library/publications/reports/Deep_Water.pdf [Accessed 4 Dec. 2017].

European Trade Union Confederation (2016). *Industrial Regions and Climate Policies: Towards a Just Transition?*. [online] Brussels. Available at: https://www.etuc.org/sites/default/files/publication/files/ces_low_carbon_economy_gb.pdf [Accessed 10 Apr. 2019].

Evans, G. and Phelan, L. (2016). Transition to a post-carbon society: Linking environmental justice and just transition discourses. *Energy Policy*, 99, pp.329-339.

Everard, M. and Longhurst, J. (2018). Reasserting the primacy of human needs to reclaim the 'lost half' of sustainable development. *Science of The Total Environment*, 621, pp.1243-1254.
Fisher, B. and Kerry Turner, R. (2008). Ecosystem services: Classification for valuation. *Biological Conservation*, 141(5), pp.1167-1169.
Fischer, J., Gardner, T., Bennett, E., Balvanera, P., Biggs, R., Carpenter, S., Daw, T., Folke, C., Hill, R., Hughes, T., Luthe, T., Maass, M., Meacham, M., Norström, A., Peterson, G., Queiroz, C., Seppelt, R., Spierenburg, M. and Tenhunen, J. (2015). Advancing sustainability through mainstreaming a social–ecological systems perspective. *Current Opinion in Environmental Sustainability*, 14, pp.144-149.
Folke, C. (2002) *'Resilience and Sustainable Development. A Report from the Swedish Environmental Advisory Council*.Point 6, available at http://www.ima.kth.se/utb/mj2694/pdf/Resilience.pdf
Food and Agriculture Organisation of the United Nations (FAO) (1995)*Code of Conduct For Responsible Fisheries*. Rome, FAO. 41 p. available at http://www.fao.org/3/a-v9878e/index.html
Friends of the Earth (2002). *Environmental issues and neighbourhood renewal*. [online] London: Friends of the Earth. Available at: https://www.foe.co.uk/sites/default/files/downloads/env_issues_neighbourhood.pdf
Fraser, N. (1987). *Social movements vs. disciplinary bureaucracies*. 1st ed. Minneapolis, Minn.: Center for Humanistic Studies, University of Minnesota.
Fraser, N. (1997) *Justice Interruptus: Critical Reflections on the "Postsocialist" Condition*. New York: Routledge
Frasier, N. (1998) Social Justice in the Age of Identity Politics: Redistribution, Recognition and Participation. In Peterson, G.B. (ed) *The Tanner Lectures on Human Values. Vol.19*. Salt Lake City, Utah. USA: University of Utah Press.
Frasier, N. (2000). 'Rethinking Recognition', *New Left Review,* 3(May – June): 107-20 [online] available at: https://newleftreview.org/II/3/nancy-fraser-rethinking-recognition
Frasier, N. (2000). 'Rethinking Recognition', *New Left Review,* 3(May – June): 107-20 [online] available at: https://newleftreview.org/II/3/nancy-fraser-rethinking-recognition
Fraser, N. 2008. *Scales of Justice*. Polity Press, Cambridge
Fraser, N., 2014. *Justice Interruptus*. Routledge, London.
Forman, A. (2017). Energy justice at the end of the wire: Enacting community energy and equity in Wales. *Energy Policy*, 107, pp.649-657.
Furness, R., Wade, H. and Masden, E. (2013). Assessing vulnerability of marine bird populations to offshore wind farms. *Journal of Environmental Management*, 119, pp.56-66.
Gaines, S. E. (1991) The polluter-pays principle: from economic equity to environmental ethos. *Texas Int'l Law Journal.* 26: 463.
Gaines, S.E. 2014. The Energy Revolution as Sustainable Development. In L. Squintani and H. Vedder with M. Reese and B. Vanheusden (eds) *Sustainable Energy United In Diversity – Challenges And Approaches In Energy Transition In The European Union*. EELF Book Series, Volume 1.
Gallego, A, Side, J, Baston, S, Waldman, S, Bell, M, James, M, Davies, I, O'Hara Murray, R, Heath, M, Sabatino, A, McKee, D, McCaig, C, Karunarathna, H, Fairley, I, Chatzirodou, A, Venugopal, V,
Global Network on Energy for Sustainable Development (2007) *Reaching the Millennium Development Goals and beyond: Access to modern forms of energy as a prerequisite.* [online] Available at: http://file:///C:/Users/User/Downloads/GNESD-paper-Reaching-MDG-and-Beyond.pdf

Germano, J., Field, K., Griffiths, R., Clulow, S., Foster, J., Harding, G. and Swaisgood, R. (2015). Mitigation-driven translocations: are we moving wildlife in the right direction?. *Frontiers in Ecology and the Environment*, 13(2), pp.100-105.
Giddings, B., Hopwood, B. and O'Brien, G. (2002). Environment, economy and society: fitting them together into sustainable development. *Sustainable Development*, 10(4), pp.187-196.
Gigha.org.uk. *The Isle of Gigha*. [online] Available at: http://www.gigha.org.uk/viewItem.php?id=8910&sectionTitle=About+Gigha
Gough, I. (2015). Climate change and sustainable welfare: the centrality of human needs: Fig. 1. *Cambridge Journal of Economics*, 39(5), pp.1191-1214.

Green Paper: Reform of the Common Fisheries Policy, COM (2009) European Commission. 163 final.
Integrated Maritime Policy COM (2007) 575.
Grossardt, T.H. and Bailey, K., (2007). Justice and the Public's Involvement in Infrastructure Planning: An Analysis and Proposal. *Practicing Planner*, 5(1).
Guertler, P. (2012). Can the Green Deal be fair too? Exploring new possibilities for alleviating fuel poverty. *Energy Policy*, 49, pp.91-97.
Gupta, R. and Irving, R. (2014). Possible effects of future domestic heat pump installations on the UK energy supply. *Energy and Buildings*, 84, pp.94-110.
Gupta, J. and Vegelin, C. (2016). Sustainable development goals and inclusive development. *International Environmental Agreements: Politics, Law and Economics*, 16(3), pp.433-448.
Guruswamy, L. (2010) Energy justice and sustainable development. Colo. J. Int'l Envtl. L. & Pol'y 21: 231.
Haggett C. (2008) Over the sea and far away? A consideration of the planning, politics and public perception of offshore wind farms. Journal of Environmental Policy and Planning;10(3):289–306
Hannigan, J. (2014). *Environmental sociology*. 3rd ed. London: Routledge, pp.33-34.
Hansen, J. (2009) *Storms of My Grandchildren: The Truth about the Coming Climate Catastrophe and Our Last Chance to Save Humanity*. London; Bloomsbury
Hansen, J., Marx, S. and Weber, E. (2004). *The Role of Climate Perceptions, Expectations, and Forecasts in Farmer Decision Making: The Argentine Pampas and South Florida*. [online] Columbia University, New York: International Research Institute for Climate Prediction (IRI). Available at: https://iri.columbia.edu/~jhansen/RoleOfClimatePerceptions.pdf
Hardin, G. (1968).The Tragedy of the Commons. *Science*, 162(3859), pp.1243-1248.
Harmon, D. (2007). A Bridge over the Chasm: Finding Ways to Achieve Integrated Natural and Cultural Heritage Conservation. *International Journal of Heritage Studies*, 13(4-5), pp.380-392.
Hartwick, J.M. (1977). Intergenerational equity and the investing of rents from exhaustible resources. *The American Economic Review*. 67 (5): 972–4.
Hassel, M. (2016). *Yttre Stengrund completely decommissioned.* [online] Available at: http://www.4coffshore.com/windfarms/yttre-stengrund-completely-decommissioned-nid3199.html [Accessed 28 Nov. 2017].
Hayhow, D., Burns, F., Eaton, M., Al Fulaij, N., August, T., Babey, L., Bacon, L., Bingham, C., Boswell, J., Boughey, K., Brereton, T., Brookman, E., Brooks, D., Bullock, D., Burke, O., Collis, M., Corbet, L., Cornish, N., De Massimi, S., Densham, J., Dunn, E., Elliott, S., Gent, T., Godber, J., Hamilton, S., Havery, S., Hawkins, S., Henney, J., Holmes, K., Hutchinson, N., Isaac, N., Johns, D., Macadam, C., Mathews,

F., Nicolet, P., Noble, D., Outhwaite, C., Powney, G., Richardson, P., Roy, D., Sims, D., Smart, S., Stevenson, K., Stroud, R., Walker, K., Webb, J., Webb, T., Wynde, R. and Gregory, R. (2016). *State of Nature Report*. [online] State of Nature Partnership. Available at: https://www.rspb.org.uk/Images/State%20of%20Nature%20UK%20report_%2020%20Sept_tcm9-424984.pdf

Hedegaard, K., Mathiesen, B.V., Lund, H., Heiselberg, P. (2012) Wind power integration using individual heat pumps – analysis of different heat storage options. *Energy* 47:284–93

Hedegaard, K. and Münster, M. (2013). Influence of individual heat pumps on wind power integration – Energy system investments and operation. *Energy Conversion and Management*, 75, pp.673-684.

Henriques, I. Sadorsky, P. (2008) Oil prices and the stock prices of alternative energy companies. *Energy Econ*;30(3):998–1010

Hettinger, N. and Throop, B. (1999). *Refocusing Ecocentrism. Environmental Ethics*, 21(1), pp.3-21.

Hilborn, R. (1995). Sustainable Exploitation of Renewable Resources. Annual Review of Ecology and Systematics, 26(1), pp.45-67.

Hofrichter, R. and Gelobter, M. (2002). *Toxic struggles*. Salt Lake City, Utah: The University of Utah Press.

Honneth, A. (2005). *The struggle for recognition*. Cambridge, Mass.: Polity Press.

Horton, R. (2014). Offline: Why the Sustainable Development Goals will fail. *The Lancet*, 383(9936), p.2196.

https://climate.nasa.gov/evidence/

Huber, J. (1982) *Die Verlorene Unschulde Der Okologie: Neu Technologien und Superindustrielle Entwicklung (The lost Innocence of Ecology: New Technologies and Superinfustrial Development)* Frankfurt am Main: Fischer.

Huber, J. (1985) *Die Regenbogengesellschaft: Okologie und Sozialpolitik (The Rainbow Society: Ecology and Social Policy)*, Frankfurt am Main: Fischer.

Huybrechts, B. And Mertens, S. (2014). The Relevance Of The Cooperative Model In The Field Of Renewable Energy. *Annals of Public and Cooperative Economics*, 85(2), pp.193-212.

Hvelplund, F. (2014). Innovative Democracy, Political Economy, and the Transition to Renewable Energy. A full-Scale Experiment in Denmark 1976-2013. *Environmental Research, Engineering and Management*, 66(4).

Implementing Agreement for Renewable Energy Technology Deployment (IEA-RETD) (2016), Cost and financing aspects of community renewable energy projects. Volume II: Danish Case Study. Ricardo Energy & Environment and Ecologic Institute, IEA-RETD Operating Agent, IEA Utrecht.

Infrastructure Planning Inspectorate (2015a) Janet Dodd. Representation number REP-0724. made 02 June 2014 Infrastructure.planninginspectorate.gov.uk. (2018) Available at: https://infrastructure.planninginspectorate.gov.uk/wpcontent/ipc/uploads/projects/EN010024/EN010024-000048Examining%20Authority%20Recommendation%20Report%20Appendix%20C%20Examination%20Library%20-%20Relevant%20Representations.pdf

Infrastructure Planning Inspectorate (2015b) Brian Willman. Representation made 14 May 2014 Available at: https://infrastructure.planninginspectorate.gov.uk/wpcontent/ipc/uploads/projects/EN010024/EN010024-

000048Examining%20Authority%20Recommendation%20Report%20Appendix%20C%20Examination%20Library%20-%20Relevant%20Representations.pdf
Infrastructure.planninginspectorate.gov.uk
https://infrastructure.planninginspectorate.gov.uk/projects/south-east/navitus-bay-wind-park/?ipcsection=docs
Institute of Health Equity (2011). *The health impact of cold homes and fuel poverty*. London
Intergovernmental Panel on Climate Change [IPCC]. IPCC, 2018: Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, Maycock, M. Tignor, and T. Waterfield (eds.)]. *World Meteorological Organization,Geneva, Switzerland, 32 pp.*
Islam, S. N. (2015) *Inequality and Environmental Sustainability*. UNDESA Working Paper No. 145. Available at: http://www.un.org/esa/desa/papers/2015/wp145_2015.pdf
Jamieson, D. (2014) *Reason in a Dark Time: Why the Struggle Against Climate Change Failed – and What It Means for Our Future.* New York, NY: Oxford University Press.so
Jenkins, K., McCauley, D., Heffron, R., Stephan, H. and Rehner, R. (2016). Energy justice: A conceptual review. *Energy Research & Social Science*, 11, pp.174-182.
Johnstone, P. and Hielscher, S. (2017). Phasing out coal, sustaining coal communities? Living with technological decline in sustainability pathways. *The Extractive Industries and Society*, 4(3), pp.457-461.
Jørgensen, PJ. Hermansen, S. Johnsen, A. Nielsen, JP. Jantzen, J. Lunden, M. (2007) *Samsø – A renewable energy island. 10 years of Development and Evaluation*. Samsø Energy Academy
Kahn, R. (2000) Siting struggles: the unique challenge of permitting renewable energy power plants, *Electricity Journal*, 13(2), pp. 21–33.
Kaiser, M. and Snyder, B. (2012). *Offshore Wind Energy Cost Modelling*. Springer London Ltd.
Kameri-Mbote, P. and Cullet, P. (1996). *Environmental Justice and Sustainable Development.: Integrating Local Communities and Environmental Management*. International Environmental Law Research Centre. IELRC Working Paper 1996 - 1[online] Genf: IELRC, p.2. Available at: http://www.ielrc.org/content/w9601.pdf [Accessed 3 Aug. 2017].
Kemp, R., Schot, J. and Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. *Technology Analysis & Strategic Management*, 10(2), pp.175-198.
Kerckhof, F., Rumes, B., Jacques, T., Degraer, S., Norro, A., (2010). Early development of the subtidal marine biofouling on a concrete offshore windmill foundation on the Thornton Bank (southern North Sea): first monitoring results. *Underwater Technol*. 29, 137e149.
Khalilian, S., Froese, R., Proelss, A. and Requate, T. (2010). Designed for failure: A critique of the Common Fisheries Policy of the European Union. *Marine Policy*, 34(6), pp.1178-1182.
King, D. (2004). Environment: Climate Change Science: Adapt, Mitigate, or Ignore?. *Science*, 303(5655), pp.176-177.

Klaassen, G., Miketa, A., Larsen, K. and Sundqvist, T. (2005). The impact of R&D on innovation for wind energy in Denmark, Germany and the United Kingdom. *Ecological Economics,* 54(2-3), pp.227-240.
Kooij, H. et al. (2018). Between grassroots and treetops: Community power and institutional dependence in the renewable energy sector in Denmark, Sweden and the Netherlands. *Energy Research & Social Science*, 37, pp.52-64.
Kopnina, H. (2013*) Forsaking Nature? Contesting 'Biodiversity' Through Competing Discourses of Sustainability. Journal of Education for Sustainable Development*. Vol 7, Issue 1, pp. 51 - 63
Kopnina, H. (2014). Future Scenarios and Environmental Education. *The Journal of Environmental Education*, 45(4), pp.217-231.
Koschová, M., Rivas-Salvador, J. and Reif, J. (2018). Continent-wide test of the efficiency of the European union's conservation legislation in delivering population benefits for bird species. *Ecological Indicators*, 85, pp.563-569.
Kubanza, N., Das, D. and Simatele, D. (2016). Some happy, others sad: exploring environmental justice in solid waste management in Kinshasa, The Democratic Republic of Congo. *Local Environment*, 22(5), pp.595-620.
Lake, R. W. (1996), Volunteers, Nimbys, and Environmental Justice: Dilemmas of Democratic Practice. *Antipode*, 28: 160–174.
Landbay (2017). *Rental Index*. [online] IMAC. Available at: https://rentcheck.landbay.co.uk/wp-content/uploads/2017/02/Rental_index_report_January17.pdf
Larsen J.H.M, Soerensen, H.C., Christiansen, E., Naef, S., Vølund, P. (2005) *Copenhagen Offshore Wind Conference. Experiences From Middelgrunden 40Mw Offshore Wind Farm*, ed Maj HS (Copenhagen, Denmark), pp 1–8
Lee, M. Abbot, C. (2003). The usual suspects? Public participation under the Aarhus convention. *The Modern Law Review*. 66 (1): 80–108
Liddell, C., Morris, C., McKenzie, S. and Rae, G. (2012). Measuring and monitoring fuel poverty in the UK: National and regional perspectives. *Energy Policy*, 49, pp.27-32.
Lind, E. and Earley, P. (1992). Procedural Justice and Culture. *International Journal of Psychology*, 27(2), pp.227-242.
Lipton, M. (1976). *Why Poor People Stay Poor*. AVEBURY.
Low, N., Gleeson, B., Elander, I. and Lidskog, R. (2000). *Consuming cities: The Urban Environment in the Global Economy after Rio*. London: Routledge.
Lucas, K. Walker, G. Eames, M. Fay, H. and Poustie, M. (2004) *Environment and Social Justice: Rapid Research and Evidence Review*, Sustainable Development Research Network, London: Policy Studies Institute
MacArthur, J. (2013). Renewable Energy and the Social Economy in Alberta. *The International Journal of Environmental Sustainability*, 8(4), pp.121-130.
Mah, A. (2012). *Industrial ruination, community, and place*. Toronto: University of Toronto.
Maffi , L. (2014) An Introduction to Biocultural Diversity. Biocultural Diversity Toolkit TVol 1. Terralingua
Markard, J., Raven, R. and Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, 41(6), pp.955-967.
Martinot E. (1998) Energy efficiency and renewable energy in Russia: transaction barriers, market intermediation and capacity building. *Energy Policy* 26:905–15

Masden, E. McCluskie, A. Owen, E. Langston, R. (2015) Renewable energy developments in an uncertain world: The case of offshore wind and birds in the UK. *Marine Policy* 51 169–172
Mason, M. Information disclosure and environmental rights: The Aarhus Convention. *Global Environmental Politics*. 10 (3): 10–31
Matthews, T., Lo, A. and Byrne, J. (2015). Reconceptualizing green infrastructure for climate change adaptation: Barriers to adoption and drivers for uptake by spatial planners. *Landscape and Urban Planning*, 138, pp.155-163.
Mauritsen, T. and Pincus, R. (2017). Committed warming inferred from observations. *Nature Climate Change*, 7(9), pp.652-655.
McCabe, A., Pojani, D. and Broese van Groenou, A. (2018). Social housing and renewable energy: Community energy in a supporting role. Energy Research & Social Science, 38, pp.110-113.
McCauley, D.A. (2017) Energy Justice: Re-Balancing the Trilemma of Security, Poverty and Climate Change. Palgrave Macmillan. Springer
McCauley, D.A. and Heffron, R.J. Stephan, H, Jenkins, K. (2013) Advancing Energy Justice: The Triumvirate of Tenets, *International Energy Law Review*, 32 (3), pp. 107-110.
McCauley, D.A. and Heffron, R. J. (2018). Just transition: Integrating climate, energy and environmental justice. *Energy Policy*, 119, pp.1-7
McLaren Loring, J. (2007). Wind energy planning in England, Wales and Denmark: Factors influencing project success. *Energy Policy*, 35(4), pp.2648-2660.
McClymont, K. & O'Hare, P. (2008). "We're not NIMBYs!" Contrasting local protest groups with idealised conceptions of sustainable communities' *Local Environment*, vol 13, no. 4, pp. 321-335. DOI: 10.1080/13549830701803273
McMichael, A. and Lindgren, E. (2011). Climate change: present and future risks to health, and necessary responses. *Journal of Internal Medicine*, 270(5), pp.401-413.
Meadows, D. H.; Meadows, D.L.; Randers, J.; Behrens III, William, W. (1972*). The Limits to Growth; A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe Books.
Meffe, G., Ehrenfeld, D. and Noss, R. (2006). Conservation Biology at Twenty. *Conservation Biology*, 20(3), pp.595-596.
Meier, H. and Rehdanz, K. (2009). Determinants of Residential Space Heating Expenditures in Great Britain. *Energy Economics*, 32 (9 5), 94 -959.
Meyer, N. and Koefoed, A. (2003). Danish energy reform: policy implications for renewables. *Energy Policy*, 31(7), pp.597-607 Meyer, T. (2016) Shifting sands: power, uncertainty and the form of international legal cooperation. *European Journal of International Law*. Vol. 27,1. Oxford University press
Mikkelson, G., Gonzalez, A. and Peterson, G. (2007). Economic Inequality Predicts Biodiversity Loss. *PLoS ONE*, 2(5), p.e444.
Ministry of Environment and Energy [MEE] (1997) Specifikation DEA. Af indhold af forproiekkter vedr.vedvarende energi-o. Copenhagen: Danish Energy Agency
Mitchell, C., Bauknecht, D. and Connor, P. (2006). Effectiveness through risk reduction: a comparison of the renewable obligation in England and Wales and the feed-in system in Germany. *Energy Policy*, 34(3), pp.297-305.
Möller, B. (2010). Spatial analyses of emerging and fading wind energy landscapes in Denmark. *Land Use Policy*, 27(2), pp.233-241.
Molm, L., Peterson, G., Takahashi, N. (2003). In the Eye of the Beholder: Procedural Justice in Social Exchange." *American Sociological Review* 68, no. 1: 128-152.

Monbiot, G. (2012). The Great Impostors. *The Guardian*. [online] Available at: http://www.monbiot.com/2012/08/06/the-great-impostors/
Morrow, K. (2013). After the Honeymoon: The Uneasy Marriage of Human Rights and the Environment under the European Convention on Human Rights and in UK Law under the Human Rights Act 1998, 43 *Rev. Gen*. 317, 368
Müller, M., Stämpfli, A., Dold, U. and Hammer, T. (2011). Energy autarky: A conceptual framework for sustainable regional development. *Energy Policy*, 39(10), pp.5800-5810
http://natura2000.eea.europa.eu/
Natural Capital Committee [NCC] (2017). Natural Capital Committee's fourth state of natural capital report. Department for Environment, Food and Rural Affairs.
Natural England. (2015) *Heritage coasts: definition, purpose and Natural England's role* - GOV.UK. [online] Available at: https://www.gov.uk/government/publications/heritage-coasts-protecting-undeveloped-coast/heritage-coasts-definition-purpose-and-natural-englands-role
Natural England and DEFRA (2017). *Wild birds: surveys and mitigation for development projects - GOV.UK. [online] Available at: https://www.gov.uk/guidance/wild-birds-surveys-and-mitigation-for-development-projects#avoidance-mitigation-and-compensation-methods*
Natural England and DEFRA (2017) *Reptiles: surveys and mitigation for development projects - GOV.UK. [online] Available at: https://www.gov.uk/guidance/reptiles-protection-surveys-and-licences#avoidance-mitigation-and-compensation-methods*
Natural Resources. Wales. (n.d.). Natural Resources Wales. [online] Available at: http://naturalresources.wales/?lang=en
Navitus Bay Wind Park | National Infrastructure Planning. [online] Available at: https://infrastructure.planninginspectorate.gov.uk/projects/south-east/navitus-bay-wind-park/?ipcsection=docs
Ndah, A.B. (2015) *Operationalizing The Sustainability Concept Through the 'Stages of Sustainable Development Model*'. Environmental Studies Program, Faculty of Arts and Social Science, Universiti Brunei Darussalam, Brunei. Darussalam
Nemalidinne, R, Yung, TZ, Vögler, A, MacIver, R & Burrows, M 2016, 'Large scale three-dimensional modelling for wave and tidal energy resource and environmental impact: Methodologies for quantifying acceptable thresholds for sustainable exploitation' *Ocean & Coastal Management*. DOI: 10.1016/j.ocecoaman.2016.11.025
Nenovsky, N. and Torre, D. (2015). Productivity-Based Protectionism: A Marxian Reconstruction of Mihail Manoilescu's Theory. *Journal of Economic Issues*, 49(3), pp.772-786.
Newton, I. *The Migration Ecology of Birds*. Oxford, GB: Academic Press, 2007. pg 53-55 ProQuest ebrary
Norgaard, R. (1988). Sustainable development: A co-evolutionary view. *Futures*, 20(6), pp.606-620.
Office for National Statistics [ONS] (2017). *Household disposable income and inequality in the UK: financial year ending 2016*. [online] Office for National Statistics. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/bulletins/householddisposableincomeandinequality/financialyearending2016#main-points
Office for National Statistics [ONS] (2016). *Excess winter mortality in England and Wales: 2015/16 (provisional) and 2014/15 (final)*. [online] Office for National Statistics. Available at:

https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/excesswintermortalityinenglandandwales/2015to2016provisionaland2014to2015final#main-points
O'Riordan, T. (1988). The Politics of Sustainability. In: R. Turner, ed., *Sustainable Environmental Management: Principles and Practice*. London: Bellhaven, pp.29-50.
Orimoloye, I., Mazinyo, S., Kalumba, A., Ekundayo, O. and Nel, W. (2019). Implications of climate variability and change on urban and human health: A review. *Cities*, 91, pp.213-223.
Oslo Convention. (1973) Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft. *Convention on the Prevention of Marine Pollution.* 93-13. In: *Oslo Convention. [online] Oslo: Committee of Foreign Relations.* Available at: http://www.gc.noaa.gov/documents/gcil_lc_frc.pdf
OSPAR Convention (1992). *Convention for the Protection of the Marine Environment of the North-East Atlantic*. Paris: OSPAR Commission. Available at: http://www.ospar.org/site/assets/files/1290/ospar_convention_e_updated_text_in_2007_no_revs.pdf
Østergaard, P. and Andersen, A. (2016). Booster heat pumps and central heat pumps in district heating. *Applied Energy*, 184, pp.1374-1388.
Owens, S. and Cowell, R. *Land and Limits: Interpreting Sustainability in the Planning Process.* New York: Routledge
Paris Convention (1974) *Convention for The Prevention of Marine Pollution From Land Based Sources*. Available at: https://treaties.un.org/doc/Publication/UNTS/Volume%201546/volume-1546-I-26842-English.pdf
Pearce, D. (1986) *The Sustainable Use of Natural Resources in Developing Countries*. Paper to the Economic and Social Research Council Workshop on Environmental Economics, University of East Anglia.
Pelenc, J. and Ballet, J. (2015). Strong sustainability, critical natural capital and the capability approach. *Ecological Economics*, 112, pp.36-44.
Pensini, A., Rasmussen, C. and Kempton, W. (2014). Economic analysis of using excess renewable electricity to displace heating fuels. *Applied Energy*, 131, pp.530-543.
Perrons, D., Skyers, S. (2003). Empowerment through Participation? Conceptual Explorations and a Case Study. *International Journal of Urban and Regional Research* 27, no. 2: 265-285.
Poptcheva, E.M. (2016). *Article 50 TEU: Withdrawal of a Member State from the EU European Parliament.* European Parliamentary Research Service, [EPRS] European Parliament PE 577.971 Available at: http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/577971/EPRS_BRI(2016)577971_EN.pdf
Radford, K. and Adams, W. (2009). Payment for Ecosystem Services and the Challenge of Saving Nature. *Conservation Biology*, [online] 23(4), pp.785-787
Raftery, A., Zimmer, A., Frierson, D., Startz, R. and Liu, P. (2017). Less than 2 °C warming by 2100 unlikely. *Nature Climate Change*, 7(9), pp.637-641.
Ramaswamy, V., Schwarzkopf, M.D., Randel, W.J., Santer,B.D. Soden, B.J. Stenchikov,G.L. (2006) *Science* Vol. 311, Issue 5764, pp. 1138-1141 DOI: 10.1126/science.1122587
Ramos-Mejía, M., Franco-Garcia, M. and Jauregui-Becker, J. (2018). Sustainability transitions in the developing world: Challenges of socio-technical transformations unfolding in contexts of poverty. *Environmental Science & Policy*, 84, pp.217-223.

Rape Crisis England & Wales. (2017). *Rape statistics. [online] Available at: https://rapecrisis.org.uk/statistics.php*
Rawls, J. (2001). *A Theory of Justice*. Belknap Press of Harvard University Press
Rawls, J. (2001) Justice as Fairness. Belknap Press of Harvard University Press
Rechtschaffen, C. (2003). *Environmental ethics and policy*. 27th ed. University of California, Davis.
Redclift, M. R. *Sustainable Development: Exploring the Contradictions* 1st ed. London: Routledge, 1989
Reisman, D. (1987). *Alfred Marshall, progress and politics*. 1st ed. New York: St. Martin's Press, p.420.
Renewable Energy Association (2016). *Development of decentralised energy and storage systems in the UK.* [online] KPMG, p.6. Available at: http://www.r-e-a.net/upload/rea_storage_report-web_accessible.pdf
Reubens, J., Degraer, S., Vincx, M., (2011). Aggregation and feeding behaviour of pouting (Trisopterus luscus) at wind turbines in the Belgian part of the North Sea. *Fish. Res*. 108, 223e227
Rodríguez-Labajos, B. and Özkaynak, B. (2017). Environmental justice through the lens of mining conflicts. *Geoforum*, 84, pp.245-250.
Roemer, J. (1982). *A General Theory of Exploitation and Class*. 1st ed. Cambridge: Harvard University Press.
Routledge, P. (1996). Critical geopolitics and terrains of resistance. *Political Geography*, 15(6-7), pp.509-531.
Rüdiger, M. (2019). From import dependence to self-sufficiency in Denmark, 1945−2000. *Energy Policy*, 125, pp.82-89.
Sachs, A. and Peterson, J. (1996). *Eco-justice:Linking Human Rights and the Environment*. Washington: Worldwatch Institute.
Sanaith, P. (2007) India 2007: High Growth, Low Development, *India Together.* [online] in press, available at: http://www.indiatogether.org/i2007-op-ed
Santer, B. D.; Taylor, K. E.; Wigley, T. M. L.; Johns, T. C.; Jones, P. D.; Karoly, D. J.; Mitchell, J. F. B.; Oort, A. H.; Penner, J. E.; Ramaswamy, V.; Schwarzkopf, M. D.; Stouffer, R. J.; Tett, S. (1996). A search for human influences on the thermal structure of the atmosphere. *Nature* vol 382, 39-46
Savaresi, A. (2019). The Rise of Community Energy from Grassroots to Mainstream: The Role of Law and Policy. *Journal of Environmental Law*.
Schlosberg, D. (2007). *Defining environmental justice: Theories, Movements and Nature.* Oxford UK: Oxford University Press.
Schlosberg, D. (1999*) Environmental Justice and the New Pluralism: The Challenge of Difference for Environmentalism*, Oxford University Pressworld, UCT Press, South Africa.
Schlosberg, D. (2003) The Justice of Environmental Justice: Reconciling Equity, Recognition, and Participation in a Political Movement in Light, A. and De-Shalit, A. *Moral and Political Reasoning in Environmental Practice*. London: MIT Press. pp.125–156.
Schnaiberg, A. (1980) *The Environment: From Surplus to Scarcity*, New York: Oxford University Press.
Schoor, T.V.D. Van Lente, H. Scholtens, B. Peine, A. (2016) Challenging obduracy: how local communities transform the energy system, Energy Res. Soc. Sci. 13 (Suppl. C) 94-105.

Sen, S. Ganguly, S. (2017) Opportunities, barriers and issues with renewable energy development–A discussion. *Renewable and Sustainable Energy Reviews*, 69, pp.1170-1181.
Sefton, T. (2002). Targeting Fuel Poverty in England: is the Government getting Warm? *Fiscal Studies*. pp.23(3):369-99.
Sefton, T. (2004) Aiming High: an evaluation of the potential contribution of Warm Front toward meeting the Government's fuel poverty target in England. CASE report 28. London: Centre for Analysis of Social Exclusion, London School of Economics and Political Science.
Sharman, A. and Howarth, C. (2016). Climate stories: Why do climate scientists and sceptical voices participate in the climate debate? *Public Understanding of Science*, 26(7), pp.826-842.
Shoreman-Ouimet, E. and Kopnina, H. (2015). Reconciling ecological and social justice to promote biodiversity conservation. *Biological Conservation*, 184, pp.320-326.
Shove, E. (2010). Beyond the ABC: Climate Change Policy and Theories of Social Change. *Environment and Planning A*, 42(6), pp.1273-1285.
Sites.duke.edu. (2011). *History: Warren County, NC | Environmental Injustice*. [online] Available at: https://sites.duke.edu/docst110s_01_s2011_sb211/what-is-environmental-justice/history/ [Accessed 2 Aug. 2017].
Slee, B. (2015). Is there a case for community-based equity participation in Scottish on-shore wind energy production? Gaps in evidence and research needs. *Renewable and Sustainable Energy Reviews*, 41, pp.540-549.
Solar Trade Association (2018). *Renewables Frustrated Again by Budget*. [online] Available at: https://www.solar-trade.org.uk/press-release-renewables-frustrated-again-by-budget/ [Accessed 21 Dec. 2018].
Solow, R. (1974). Intergenerational Equity and Exhaustible Resources. *The Review of Economic Studies*, 41, p.29.
Solow, R. (1986). On the Intergenerational Allocation of Natural Resources. *The Scandinavian Journal of Economics*, 88(1), p.141.
Sovacool, B. (2013). *Energy & ethics*. Basingstoke: Palgrave Macmillan,
Soutar, I. and Mitchell, C. (2018). Towards pragmatic narratives of societal engagement in the UK energy system. *Energy Research & Social Science*, 35, pp.132-139.
Sovacool, B. and Dworkin, M. (2015). Energy justice: Conceptual insights and practical applications. *Applied Energy*, 142, pp.435-444.
Spaargaren, G. and Mol, A. (1992). Sociology, environment, and modernity: Ecological modernization as a theory of social change. *Society & Natural Resources*, 5(4), pp.323-344.
Späth, P. and Rohracher, H. (2010). 'Energy regions': The transformative power of regional discourses on socio-technical futures. *Research Policy*, 39(4), pp.449-458.
Sperling, K. (2017). How does a pioneer community energy project succeed in practice? The case of the Samsø Renewable Energy Island. *Renewable and Sustainable Energy Reviews*, 71, pp.884-897.
Stafford-Smith, M., Griggs, D., Gaffney, O., Ullah, F., Reyers, B., Kanie, N., Stigson, B., Shrivastava, P., Leach, M. and O'Connell, D. (2016). Integration: the key to implementing the Sustainable Development Goals. *Sustainability Science*, 12(6), pp.911-919.
Stec, S. and Casey-Lefkowitz, S. *The Aarhus Convention: An Implementation Guide*. United Nations Economic Commission for Europe
Steele, J. (2001) Participation and deliberation in environmental law: exploring a problem-solving approach 21(3) *OJLS* 415 at 437

Stocker, T.F., Qin, D. Plattner, G.-K. Tignor, M. Allen, S.K. Boschung, J. Nauels, A. Xia, Y. Bex V. and Midgley, P.M. (2013) *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [IPCC] (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp,
Task Force on Cultural and Spiritual Values of Protected Areas (CSVPA) within the World Commission on Protected Areas (WCPA) of the World Conservation Union (IUCN). Med-ina.org. (n.d.). *The Delos Initiative*. [online] Available at: http://www.med-ina.org/delos/basic.htm#_ftn1
Taylor, C., Gutmann, A., Appiah, K., Habermas, J., Rockefeller, S., Walzer, M. and Wolf, S. (1994). *Multiculturalism*. Princeton: Princeton University Press,
Teilmann, J. and Carstensen, J. (2012). Negative long-term effects on harbour porpoises from a large scale offshore wind farm in the Baltic—evidence of slow recovery. *Environmental Research Letters*, 7(4), p.045101.
Toke, D. (2002) Wind power in UK and Denmark: can rational choice help explain different outcomes?, *Environmental Politics*, 11, pp. 83–100
Toke, D., Breukers, S., Wolsink, M., (2008). Wind power deployment outcomes: how can we account for the differences? Renewable and Sustainable *Energy Reviews* 12, 1129–1147
Tong, S. and Ebi, K. (2019). Preventing and mitigating health risks of climate change. *Environmental Research*, 174, pp.9-13.
Topham, E. and McMillan, D. (2017). Sustainable decommissioning of an offshore wind farm. *Renewable Energy*, 102, pp.470-480.
Torres, G. (1994) Changing the Way Government Views Environmental Justice (Keynote Address), *Journal of Civil Rights and Economic Development*: Vol. 9: Iss. 2, Article 15
Trudeau, D. (2018). Integrating social equity in sustainable development practice: Institutional commitments and patient capital. *Sustainable Cities and Society*, 41, pp.601-610.
UK Cabinet Office (2017). *Implementing the Sustainable Development Goals*. Available at: https://www.gov.uk/government/publications/implementing-the-sustainable-development-goals/implementing-the-sustainable-development-goals
UK National Ecosystem Assessment (2011) The UK National Ecosystem Assessment: Synthesis of the Key Findings. UNEP-WCMC, Cambridge.
UK Government (2009) *Green Paper: Reform of the Common Fisheries Policy, COM; European Commission. 163 final.*
UK Government (2011) The Carbon Plan: Delivering our low carbon future available at https://www.gov.uk/government/publications/the-carbon-plan-reducing-greenhouse-gas-emissions--2
UK Office for National Statistics.*UK trade: December 2016.* (2018). https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/bulletins/uktrade/nov2016
United Nations (2013). *Sustainable Development Challenges. World Economic and Social Survey*. [online] New York: Department of Economic and Social Affairs. Sales No. E.13.II.C.1. Available at: https://High.un.org/content/documents/2843WESS2013.pdf
United Nations. (1992). *Agenda 21: The United Nations programme of action from Rio*. New York, NY, USA
United Nations (2015). 70/01. Transforming our world: the 2030 Agenda for Sustainable Development. UN Doc A/RES/70/1 (25 September 2015) 54. New York

United Nations Convention on Access to Information, Public Participation In Decision-Making And Access To Justice In Environmental Matters, (1998)
United Nations (2017). Draft decision VI/8k concerning compliance by the United Kingdom of Great Britain and Northern Ireland with its obligations under the Convention. Meeting of the Parties to the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters. [online] Budva, Montenegro: Aarhus Convention Compliance Committee. Available at: https://www.unece.org/fileadmin/DAM/env/pp/mop6/Documents_aec/ECE.MP.PP.2017.30_aec.pdf
United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters 'The Aarhus Convention' (1998) 2161 UNTS 447; 38 ILM 517
University of Maryland Center for Environmental Science. (2014) "Impact of offshore wind farms on marine species." *Science Daily*.16 October 2014. Available at: www.sciencedaily.com/releases/2014/10/141016123608.htm'
Uswitch (2015). *UK landlords add over £161 million to tenants' energy bills by denying their right to switch*. [online] Available at: https://www.uswitch.com/media-centre/2015/09/uk-landlords-add-over-161-million-to-tenants-energy-bills-by-denying-their-right-to-switch/
Van Den Burg, S., Kamermans, P., Blanch, M., Pletsas, D., Poelman, M., Soma, K. and Dalton, G. (2017). Business case for mussel aquaculture in offshore wind farms in the North Sea. *Marine Policy*, 85, pp.1-7.
Verma, P. and Raghubanshi, A. (2018). Urban sustainability indicators: Challenges and opportunities. *Ecological Indicators*, 93, pp.282-291.
Verbruggen, A. Fischedick M. Moomaw, W. Weir, T. Nadai, A. Nilsson, L.J. Nyboer, J. Sathaye, J. (2010) Renewable energy costs, potentials, barriers: conceptual issues. *Energy Policy* 2010;38(2):850–61.
Von Neumann, J. (1955) Can we Survive Technology? *Fortune* (June). Re-printed in Sprout and Sprout (eds) (1962) *Foundations of International Politics.* New York: Van Nostrand Reinhold
Vukmanovic, O. (2011) *Quarter of Homes seen in Fuel Poverty in 2015*. Reuter News Service [online] Available at: https://www.reuters.com/article/britain-energy-poverty/quarter-of-uk-homes-seen-in-fuel-poverty-by-2015-idUSL5E7LA13W20111010
Walker, G. (2008). What are the barriers and incentives for community-owned means of energy production and use? *Energy Policy* 36, 4401–4405.
Walker, G. (2009). Beyond Distribution and Proximity: Exploring the Multiple Spatialities of Environmental Justice. *Antipode*, 41(4), pp.614-636.
Walker, G. and Day, R. (2012). Fuel poverty as injustice: Integrating distribution, recognition and procedure in the struggle for affordable warmth. *Energy Policy*, 49, pp.69-75.
Walker, G. and Devine-Wright, P. (2008). Community renewable energy: What should it mean*?*. *Energy Policy*, 36(2), pp.497-500.
Walker, G.P, Mitchell, G., Fairburn, J. and Smith, G. (2003) Environmental Quality and Social Deprivation. Phase II: National Analysis of Flood Hazard, IPC Industries and Air Quality. R&D Project Record E2-067/1/PR1, The Environment Agency, Bristol
Warren, C.R., Birnie, R.V., (2009) Re-powering Scotland: wind farms and the 'energy or environment?' debate. Scottish Geographical Journal 125:97–126.

Warren, C. and McFadyen, M. (2010). Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland. *Land Use Policy*, 27(2), pp.204-213.
Weber, E. U. (1997). Perception and expectation of climate change: Precondition for economic and technological adaptation. In M. Bazerman, D. Messick, A. Tenbrunsel & K. Wade-Benzoni (Eds.), *Psychological and Ethical Perspectives to Environmental and Ethical Issues in Management* (pp. 314-341). San Francisco: Jossey-Bass
Weber , M. (1978). *Economy and Society*. University of California Press. pp. 24–5
Weinstein, M., Baird, R., Conover, D., Gross, M., Keulartz, J., Loomis, D., Naveh, Z., Peterson, S., Reed, D., Roe, E., Swanson, R., Swart, J., Teal, J., Turner, R. and van der Windt, H. (2007). Managing coastal resources in the 21st century. *Frontiers in Ecology and the Environment*, 5(1), pp.43-48.
Westmill.coop. (2008). *Westmill Wind Farm*. [online] Available at: http://www.westmill.coop/westmill-wind-farm/
Wilhelmsson, D., Malm, T., Ohman, M.C., (2006). The influence of offshore wind power on demersal fish. *ICES J. Mar. Sci*. 63, 775-784.
Wilshusen, P., Brechin, S., Fortwangler, C. and West, P. (2002). Reinventing a Square Wheel: Critique of a Resurgent "Protection Paradigm" in *International Biodiversity Conservation. Society & Natural Resources*, 15(1), pp.17-40.
Wind Europe (2017). *Unleashing Europe's offshore wind potential A new resource assessment*. [online] BVG Associates, Available at: https://windeurope.org/wp-content/uploads/files/about-wind/reports/Unleashing-Europes-offshore-wind-potential.pdf
Wolsink, M. (2007) Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'. Renewable and Sustainable Energy Reviews; 11:1188–207
World Commission on Environment and Development. United Nations. (1987). *Report of the World Commission on Environment and Development: Our Common Future.* Oxford: Oxford University Press
www.gov.uk
Wynne, B. (1982). *Rationality and Ritual: The Windscale inquiry and Nuclear Decisions in Britain*. Chalfont, St Giles: British Society for the History of Science;
Yang, T. (2006) *Towards an Egalitarian Global Environmental Ethics. Environmental Ethics and International Policy*. UNESCO
Young, I.M. (1990), *Justice and the Politics of Difference*, Princeton, NJ: Princeton University Press
Young, I. (1990). Five Faces of Oppression. In: I. Young, ed., *Justice and the Politics of Difference*, 1st ed. Princeton: Princeton University Press,
Zoellner, J., Schweizer-Ries, P., Wemheuer, C. (2008). Public acceptance of renewable energies: results from case studies in Germany. *Energy Policy* 36, 4136–4141

International Legislation

International Covenant on Economic, Social and Cultural Rights. 1966.
Universal Declaration of Human Rights. 1948 Office of the High Commissioner on Human Rights [OHCHR] *Universal Declaration of Human Rights. 1948* Available at: https://www.ohchr.org/EN/UDHR/Documents/UDHR_Translations/eng.pdf
International Covenant on Economic, Social and Cultural Rights. 1966. (ICESCR) Available at: https://www.ohchr.org/Documents/ProfessionalInterest/cescr.pdf

UNFCCC (1997) Kyoto Protocol to the United Nations Framework Convention on Climate Change adopted at COP3 in Kyoto, Japan, on 11 December 1997 The United Nations.

EU Legislation

Directive 2018/2001 of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (Recast Renewables Directive)
Directive 2009/72/EC concerning common rules for the internal market in electricity
Directive 2009/73/EC - concerning common rules for the internal market in natural gas
Directive 2009/28/EC Of the European Parliament And Of The Council. Official Journal of the European Union. 2009. 140/16. (Renewable Energy Directive)
Directive 2001/77/EC on Electricity Production from Renewable Energy Sources
Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)
Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive)
Directive 2000/60/EC establishing a framework for Community action in the field of water policy (Water Framework Directive)
European Convention on Human rights.
Energy Performance of Buildings Directive 2002/91/EC
Environmental Impact Assessment Directive 85/337/EEC
Marine Strategy Framework Directive 2008/56/EC
Regulation 2371/2002 of the European Parliament and of the Council - Conservation and exploitation of marine resources
Regulation 2015/812 of the European Parliament and 932Of The Council

Denmark Legislation

Promotion of Renewable Energy Act 2009 Act no. 1392

UK Legislation

Civil Procedure (Amendment) Rules 2017 SI 2017/95
Climate Change Act 2008 c 27
Conservation of Habitats and Species Regulations 2010 No. 490 (The Habitats Regulations)
Countryside and Rights of Way Act 2000 c.37
Criminal Justice and Courts Act 2015 c.2
Electricity Act 1989 c. 29
Electricity and Gas (Internal Markets) Regulations 2011 No. 2704
Energy Act 2004 c.20
Housing and Planning Act 2016 c.22
Human Rights Act 1998 c. 42.
Hunting Act 2004 c.37
Natural Environment and Rural Communities Act 2006 SI 2006/2541 (C.86)
The Conservation (Natural Habitats, &c.) Regulations 1994 S.I. 1994/2716.
Marine and Coastal Access Act 2009 c.23
Secretary of State for Trade and Industry (2003). Energy White Paper - Our energy future - creating a low carbon economy. The Stationery Office.
Town and Country Planning (Development Management Procedure) (England) Order 2010 No. 2184

Cases

ClientEarth (No 2) vs. Secretary of State for the Environment, Food and Rural Affairs (SEFRA) [2016]EWHC 2740
Dobson v Thames Water Utilities Limited [2009] EWCA Civ 28
Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij 2004. Case C-127/02,
Marcic v Thames Water Utilities [2003] UKHL 66
Statistics