Sustainable ‘land use’ Development?

Tension between acting local and thinking global? Case study of public opinion toward Wind Turbines’ in Powys, Wales.

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Please do not print. It costs you but in all probability it costs the environment more.
ABSTRACT

As citizens, sustainability asks us a fundamental question, what kind of world do you want to live in now, and in future? Sustainability is yet to be succinctly defined, although perhaps learned experiences represent the way forward to answer the fundamental question. Attitudes are analysed from a sample of 110 Town and Community Councils to represent a proxy of local public opinion in Powys, Wales to address this study’s aim of analysing local attitudes to evaluate the role of locally produced renewable energy when working toward global sustainability.

Global sustainability is as good as the sum of local sustainability added together thus, ‘think global, act local’ becomes pertinent when working toward sustainability. The phrase appears to contain tension of local communities accepting development for a global community. This tension appears to be occurring within Powys in the case of wind turbines. Therefore, this study analyses the general attitude toward wind turbines evaluating whether there is an acceptable scale of turbine development in the context of sustainable development.

Results indicate an overall recognition of the role of renewable energies and wind turbines in working toward sustainability although, this does not translate into a willingness to act locally. Respondents selected a scale of acceptable height (45m), number (10) and distance (1300m) of wind turbine suggesting a scale of acceptability.

The main conclusion is if local communities are expected to act locally toward global sustainability, social and political distances must decrease creating opportunity for empowering communities through responsive involvement in sustainable development processes.

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CHAPTER 1–INTRODUCTION

‘Present efforts to guard and maintain human progress, to meet human needs, and to realise human ambitions are simply unsustainable – in both the rich and poor nations. They draw too heavily, too quickly, on already overdrawn environmental resource accounts to be affordable far into the future without bankrupting those accounts. They may show profit on the balance sheets of our generation, but our children will inherit the losses. We borrow environmental capital from future generations with no intention or prospect of repaying

World Committee Environment and Development (1987)

1.1. Background
If sustainability is seen as a challenge to humanity which needs achieving, then it can be done despite reservations about how (Robinson, 2004; Gibson, 2006). Political commitment to achieving sustainability (economic, social and environmental) is increasingly evident from world summits including Rio Earth Summit (1992), Johannesburg (2002) and Kyoto (2007) amongst others. Principles and Articles agreed at these summits find themselves transposed into supra-national and national law and policy, examples include the European Union (2006) Sustainable Development Strategy (hereafter, EU (2006) SDS), section 79 Government of Wales Act (2006) proposing a scheme of sustainable development, and section 39(2) of the Planning and Compulsory Purchase Act (2004) where it notes, ‘the person or body must exercise the function with the objective of contributing to the achievement of sustainable development’.

Taking the phrase, ‘think global, act local’ and applying it to sustainability, it appears to contain a tension insofar as placing pressure on local communities to act in accepting development toward local sustainability firstly, then subsequently benefiting a global community toward global sustainability. Sustainability is not just about the environment and mitigating global warming, it is equally about social, political and economic structures of society now and into the future. There appears no ‘one’ way of working toward local sustainability as different localities have different resources to work with, localities decide differently what falls within local sustainability, hold concerns for what is and is not considered locally sustainable with different levels of importance, and decisions of what is ‘correct’ local sustainability in one locality may not be the same for another locality. It stands to reason therefore, that locals should act toward local sustainability firstly in order to subsequently step toward global sustainability.

In Wales, the tension between thinking global and acting local appears to be tested currently in terms of land use with one example being onshore wind turbines. The perception is that positive gains through mitigating greenhouse gas emissions from electricity production occur on a national and international scale, while the negative impacts, including noise and aesthetic changes, are obvious to local people (Arvai, 2007 in Hall et al, 2013). A tension which has been summarised as local costs/burden versus global benefits (Hall et al, 2013). Nevertheless, negative local attitude toward wind turbines does not automatically mean locals are opponents to global sustainability. Rather, if locals have a negative attitude toward a type of development, this surely becomes a point of conversation with local communities in a participatory and involved discussion about the meaning of local sustainable development, what does it include? If local sustainable development does not include wind turbines then what is the better or preferred alternative? This study seeks to understand whether there is a tension of acting locally
when thinking globally firstly, and then presents a conceptual idea for how to begin discussions of local sustainability.

1.2. Statement of Aims
To understand the starting position of local public attitude toward renewable energy production within the local when working toward sustainability, the aim of this thesis is to analyse local attitudes to evaluate the role of locally produced renewable energy when working toward global sustainability. In order to draw conclusions to the aim, the following research questions are addressed:

A. What is the overriding local public attitude toward renewable energy and wind turbines when acting local but thinking global in working toward sustainability?

B. Using onshore wind turbines as a case study, is there a scale of acceptable turbine development?

Question C below is simply demonstrated here as a proof of concept, presenting a conceptual idea for how to begin discussions of local sustainability, and does not represent a result. The idea here is simply tested as part of the training within planning and development, and to test the research method as a point-in-time potential tool for spatial planners working toward sustainability. This is explained in the methodology section, not presented in the results section as it is not a result, and simply discussed within chapter 6.

C. By distinction from what is ‘acceptable’ wind turbine development (research question B), where wind turbine scale is considered ‘unacceptable’, do areas of concern which fall within Sustainable Development as prescribed by European Commission (2011) SDS: Monitoring Report explain minimum unacceptable turbine scale? If yes, which areas are of greater local public importance when working toward sustainability?

Achieving global sustainability requires local sustainability where the former seemingly cannot occur without local people, cooperatively acting locally for local sustainability. As an estimate of public attitudes, this study focuses upon all 110 local Town and Community Councils in Powys to understand the overarching local public attitude toward renewable energy and wind turbines toward local sustainability in a two step process. The first step seeks to identify whether there is a tension between acting local and thinking global (research question A). The second step uses onshore wind turbines as one ‘indicator’ to indicate whether there is a tension between acting locally when thinking globally (research question B). This second step analyses whether there is a turbine scale in terms of height, number and distance considered broadly acceptable across respondents.

Assuming there was a scale of wind turbine acceptance, research question C was intended to provide data regarding limits to such acceptance referred to as ‘unacceptable’ wind turbine scale. Such unacceptable scale of turbine development was assumed to be above what was selected as acceptable for turbine height, more than the acceptable number of turbines, and below the selected acceptable turbine distance. Where the scale of onshore wind turbine development was considered ‘unacceptable’, which of the 6 ‘areas of interest’ explain that unacceptable scale, and do those areas of interest fall within sustainable development prescribed by the European Commission (2011) Sustainable Development Strategy: Monitoring Report (hereafter, EC (2011) SDS: Monitoring Report)? The 6 ‘areas of interest’ were employment, education, population, human health, climate change and, transport and mobility. These ‘areas of interest’ are drawn specifically from the EC (2011) SDS: Monitoring Report as they are considered to contribute toward sustainable development as set by the European Union. However, given only 110
respondents were approached for the study, there was always a risk of a low response rate meaning insufficient information to draw conclusions to the aim.

1.3. Scope of this study
To set the scope of this study, sustainable development, sustainability (see 2.1), and ‘global’ are discussed in the context of European Union objectives. Therefore, only considers ‘more economically developed’, ‘western’ understanding of the terms, and only insofar as related to land use under UK planning laws (as apply to Wales) including the Planning Act (2008). This study contends, if the way we use our land does not fit into sustainable development and eventually sustainability, then how can systems of education, health care and employment above the scale of land use be considered sustainable as well? Sustainable development within this study excludes developing countries thus, excludes important considerations of sustainability at a global scale including poverty alleviation and food production to name just two. Nevertheless, this study provides information evaluating the role renewable energy and wind turbines play in a ‘local’ (County of Powys) when working toward sustainability. In summary, scope of this study is delimited to a European Union understanding.

The County of Powys in Wales (Figure 7) was selected in this study for two reasons. Firstly, Powys has a range of potential renewable energy resources including hydro and solar not just wind therefore, potentially a future target for renewable energy installations. Secondly, Powys is subject to a combined public inquiry (Banksolutions, 2014) involving 5 wind farm applications. Smaller scale wind turbines’ for example 34m height have been granted planning permission by Powys County Council (an example see, Powys County Council, 2013). However, Powys County Council voted in objection/rejection to the 5 wind farm applications (example of 3 see Powys County Council, 2012a) suggesting there is a scale of wind turbine considered broadly acceptable which presumably works toward local sustainability for subsequent global sustainability.
CHAPTER 2–THEORETICAL FRAMEWORK

‘I not only use all the brains I have, but all that I can borrow’

Woodrow Wilson (1914)

Real life sustainability themes including wind turbines seldom fall neatly into social, economic or environmental spheres making the Sustainable Development process ‘untidy’. Consequently, figure 1 shows the route of reviewing written material in a flow chart for clarity of thought. Areas concentrated upon in this study under ‘public attitudes and opinions...’ including employment and population etc fall within sustainable development indicators contained in EC (2011) SDS: Monitoring Report (Table 1). These are used to understand whether public concerns fall within sustainable development as ‘indicated’ within that document.

2.1. Sustainable Development and Sustainability

The World Commission on Environment and Development (hereafter, WCED) (1987) popularised ‘sustainable development’ stating, ‘humanity has the ability to make development sustainable—to ensure development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987, paragraph 27). Sustainable development was meant relating economic development with poverty alleviation. ‘Its genius lay in recognition that combating poverty (which is not just economic) and protecting the environment (which is not just biophysical) were necessary to each other and both were likely to fail if not addressed together’ (Gibson, 2006, 261). The definition represented the beginning for serious consideration of how to ‘do’ sustainable development.

Sustainable development can be understood as a process toward achieving the goal of sustainability (Hjorth and Bagheri, 2006; Welsh Assembly Government, 2009). It is ‘how’, the process of ‘getting to’ sustainability therefore places heavy burdens on processes of getting to sustainability rather than the substance of sustainability itself. Appropriate and relevant sustainable development cannot occur without an understanding of the substance of sustainability because the latter asks questions of a fundamental nature; what are we aiming to achieve from the sustainable development process, how will we know when we’re in a position to remark upon economic, social and environmental structures and label them ‘sustainable’? At a global scale, ‘sustainability’ asks us all; what kind of world we collectively want to live in now and in future’ (Robinson, 2004). In this defined context, sustainable development becomes important in working towards that desired world and subsequently lends itself to public involvement.

In this connection, ‘development’ is usefully defined when working toward sustainability, as it has been misinterpreted to be synonymous with ‘growth’. The distinction is, ‘to grow means to increase in size by the assimilation or accretion of materials. To develop means to expand or realise the potentialities of; to bring to a fuller, greater, or better state. When something grows it gets quantitatively bigger; when something develops it gets qualitatively better, or at least different. Quantitative growth and qualitative improvement follow different laws. Our planet develops over time without growing’ (Meadows et al, 1992, xix). The expression is, ‘there are limits to growth, there need be no limits to development’ (ibid, 1992, xix).
Figure 1. Flow chart displaying the theoretical basis for this study.
Sustainable 'land use' Development

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2.1.1. Substance

Sustainability is understood to comprise social, economic and environmental spheres (Figure 2), commonly denoted the three pillars of sustainability (Gibson, 2006). Munier (2005) summarises the three pillars:

- **environmental** dimension refers to resource preservation, ecological integrity and biological diversity;
- **economic** dimension refers to the extent economic systems are capable of continuing for the long term, and maintaining high and stable employment levels, and
- **social** sustainability refers to attaining social equity and equality, equal prospect of obtaining shelter, education and health care etc, without discrimination.

Socialists, economists, environmentalists amongst others have sought to define sustainability although, often offend another group in attempted definitions. Examples include, Pearce et al (1990) cited in Hjorth and Bagheri (2006) who consider sustainable development a vector of desired social goals, which society tries to maximise by improving its components. Components of the vector are: real per capita income, hygiene and nutrition, educational successes, access to resources, equitable wealth distribution, and increase in liberty. Sustainable development is a condition in which the vector of development does not decrease. Environmental enthusiasts of sustainable development may consider the above definition to miss out many environmental considerations, and rather focused upon social and economic improvements. Environmentally conscious definitions include, ‘sustainable development is [...] understood as proper management of limited resources’ (Nilsson and Ryden, 2012, 222 in: Karlsson and Ryden, eds) and ‘the ability of humans to continue to live within environmental constraints’ (Robinson, 2004, 370) both leaving social and economic facets out of the sustainability picture. A socially conscious definition typically refers to justice although often omitting direct reference to the economy which economists don’t favour, ‘the need to ensure a better quality of life for all, now and into the future, in a just and equitable manner, whilst living within the limits of supporting ecosystems’ (Agyeman et al, 2003, 2). Consequently, definitions’ offered are diverse depending on the school of thought the author favours, whether a thoroughbred economist, environmental enthusiast or social fanatic. There is likely some truth in all definitions offered, even ones not cited here.

Succinct definitions aside although pulling themes from them, Klauer (1999) in Hjorth and Bagheri (2006) considers the common idea amongst sustainability definitions is preserving a condition. For instance Pearce et al’s (1990) definition in Hjorth and Bagheri (2006) preserves the characteristics of a socio-economic system, Nilsson and Ryden’s (2012) definition seeks to preserve limited resources, whilst Robinson (2004) seeks to preserve earth’s life supporting system. In WCED (1987) definition, sustainability is defined as preserving human ability to meet their needs without compromising future generations’ ability to meet their needs. Themes pertaining to the substance of sustainability can be derived from a starting position of ‘preserve’. By its nature ‘preserve’ appears the correct term when working toward sustainability rather than ‘conserve’ which has increasingly appeared in sustainability discussion from an economists perspective. Robinson (2004) clarifies the position,

‘On the one hand were those who favoured the preservation of natural areas in what was perceived to be a pristine (i.e. undeveloped) form. [...] The alternative
‘conservationist’ position also favoured the protection of natural areas, but this protection was essentially a form of enlightened self-interest, conserving land and resources for later human use, including resource extraction and what today we would call eco-tourism’ (Robinson, 2004, 371).

Given the above, it becomes clear preservation is probably not possible, reason being that humans have and probably will continue to manipulate their social, economic and environmental situations to suit themselves. However, a compromise position along the spectrum between preservation and conservation is humanity as ‘custodians’ of earth, seeking to improve the social, economic and environmental condition within which we all live for the next generation to do the same.

![Figure 2](image_url) Three pillars of sustainability (adapted from Liu, 2014, 613).

However, several academics assert it is unnecessary to delimit sustainability into a concise and succinct definition. Rather view sustainability as a moving target (Hjorth and Bagheri, 2006), understand sustainable development as a conversation involving all who want to get involved in expressing various and multiple views conflicting or otherwise to be debated (Robinson, 2004), and sustainable development is not a balancing or trade-off between the three pillars where typically the economy wins (see Planning Inspectorate, 2013a for an example). Rather, it is fundamentally integrative involving all areas of life which ironically do not fall tidily within any of the three pillars (Gibson, 2006). This leads to ‘how’ to get to sustainability, the procedure.

2.1.2. Procedure

Unfortunately at present, there is no comfortable answer neither solution to the problem of when a given land use contributes toward sustainability. There appears implied agreement
and a level of consensus amongst academics regarding sustainability being difficult to pin
down therefore, perhaps learned experiences is the way forward toward sustainability.
‘Sustainability is increasingly cited as ideals or goals of development efforts ... [such]...
ideals should be perceived as desired ends that one, it is hoped, approaches indefinitely
even if one can never achieve them completely. This concept makes sustainability a
moving target which is continuously getting enhanced as our understanding of the system
improves. Sustainable development must, then, be seen as an unending process defined
neither by fixed goals nor the specific means of achieving them, but by an approach to
create change. The necessity for change can be diagnosed by tracing trends and going
through a learning process regarding the system under study and its environment’ (Hjorth
and Bagheri, 2006, 76). Prima facie sustainability as a moving target makes it tricky to
ever achieve, and suggests a single method in the process of sustainable development
may be meaningful in one context but meaningless in another to which Robinson (2004)
agrees, ‘no single approach will, or indeed should be, seen as the correct one’ (382).

When sustainability is understood to be of public benefit, a starting point will always be
public views and opinions which is where Robinson (2004) finds currency, asserting
sustainability is the emergent property itself noting, ‘we are inescapably involved in a world
in which there exist multiple conflicting values, moral positions and belief systems that
speak to the issue of sustainability. [...] Sustainability is itself the emergent property of a
conversation about what kind of world we collectively want to live in now and in future. [...]’
The way forward involves the development of new forms of partnership, and new tools for
creating political dialogue, that frame the problems as questions of political choice, given
uncertainty and constraints; that renounce the goal of precise and unambiguous definition
and knowledge; and that involve many more people in the conversation’ (Robinson, 2004,
382). Taken together, the moving target of sustainability is itself developing as a
consequence of the conflicting values, moral positions and belief systems ‘conversation’.
These conversations involving as many as possible can directly and indirectly express
answers to the question of what kind of world we want to live in now and in future. As our
world develops, so too will the target of sustainability where our children and grandchildren
seek to add their views into the conversation, thus the old adage, ‘moving with the times’.

Additional to concepts of sustainability as a conversation (Robinson, 2004) and moving
target (Hjorth and Bagheri, 2006), sustainability is integrative (Gibson, 2006). Issues of
today do not fit tidily into the three pillars therefore, ‘demand responses that seek multiple,
mutually reinforcing contributions’ (Gibson, 2006, 263). Sustainability requires individual
interest in the conversation minded toward achieving a collective benefit. Scale becomes a
determining factor in what we would consider collective benefit, collective benefit for how
many; the village, the country or the world? Equally, issues of ‘justice’ are raised insofar as
questioning whether people in the village, country or world can really speak to the issue of
sustainability in a ‘just’ way considering the ‘justice’ of their decisions made now upon
future generations’. Justice issues are not considered here, arguments have been clear
where academics assert opinion for public involvement (example; Cowell et al, 2012).

Gibson (2006) asserts decision-makers can be held more accountable toward achieving
sustainability where the public act in a ‘tenacious commitment’ when involved in decision-
making processes. Not simply a tick-box exercise to show the participation part of the
process is done, rather participation viewed as continued dialogue and a starting point for
this has been asserted using concern-oriented assessment of sustainability. Essentially,
given there are no (or very few) matters of fact in sustainability because the issues are
complex, contested and changeable they become situation specific and cannot be treated
as matters of fact for all cases. Therefore, there can be no individual ‘expert’ decision-makers in sustainability. Consequently, replacing matters of fact with ‘matters of concern’ takes sustainability from a group of ‘experts’ into a process of public deliberation. ‘A focus on matters of concern in a process of deliberation, ensures that the debate on sustainable development is not reduced to an allotted matter that is ‘known’ and hence, remains in the hands of a small group of experts, but tries to involve a concerned public, centred around a particular issue of sustainability’ (Vandenabeele and Van Poeck 2012, 53 in: Wals and Corcoran, eds). This method could become relevant regarding land use under UK planning laws as apply to Wales which have, engrained in law, the principle of public involvement affording anyone the opportunity to express concerns and have those concerns addressed by developers with evidence.

Sustainability as a conversation, moving target, integrative and ultimately a political act not just a scientific or expert construct therefore lends itself to public involvement. Such facets become useful when considering land use sustainability because different issues arise from an application to build a house compared to issues arising from other land uses such as wind turbines. Separately these land uses raise issues themselves, whether the house fits with the character and appearance of neighbouring houses or, whether a wind turbine fits with the landscape character. Placed together they may raise other issues for example, loss of amenity, and/or unacceptable visual impact. The problem is whether any two or more land uses can coexist toward sustainability at a local scale, and indeed this is where, yet to be developed sustainability assessment needs to serve its practical function. It is in connection to decisions made under UK planning laws (as apply to Wales) regarding land use that this study provides a conceptual suggestion for a sustainability assessment process using the aforementioned concern-based method, investigating areas of concern where scale of wind turbine development is considered ‘unacceptable’ (see 1.2, question C).

2.1.3. Systems Thinking: Actions, Arenas and Resources

Regarding the integrative nature of sustainability (Gibson, 2006) some academics have moved from the segmented and fractured practise of researching the 3 pillars of sustainability, to thinking and viewing sustainability and sustainable development as a dynamic system (Hjorth and Bagheri, 2006). ‘Systems Thinking is the art and science of linking structure to performance, and performance to structure—often for purposes of changing structure (relationships) so as to improve performance’ (Richmond, 1994 in: Hjorth and Bagheri, 2006, 79). Applying systems thinking to sustainability recognises and places onus on the integrity and interaction between its components, on cause and effect interrelations between the 3 pillars of sustainability, rather than the traditional method which ‘involves breaking a problem into components, studying each part in isolation, and then drawing conclusions about the whole’ (Hjorth and Bagheri, 2006, 79). Thus, a move from a fragmentation paradigm to holism, understanding real relationships among a system’s parts, rather than the parts themselves (Ibid, 2006). It also asserts that conventional linear and mechanistic thinking of cause and effect are increasingly ineffective to address modern problems because systems in society (for example, social and economic) have become increasingly interconnected, and the most important issues are interrelated in ways that defy linear causation. Thus arguably ‘humanity is already in unsustainable territory’ (Ibid, 2006, 79).

Systems thinking applied to sustainability seeks to join ‘together the three dimensions of environment, economy and society; sustainable development introduces a process to save
basic natural resources from being ruined and emphasises the forgotten key role of the environmental services in the improvement of livelihoods and incomes. It refers to a process in which the economy, environment and ecosystem of a region change in harmony, and in a way that will improve over time’ (Hjorth and Bagheri, 2006, 76). Whether the system of sustainability is achievable appears to depend on the scale of the ‘region change in harmony’. This study focuses on whether a tension exists between thinking global whilst acting local therefore, there are two ‘regions’ of acting toward sustainable development, firstly the local region and secondly, its contribution to the global regional system of sustainability.

Furthermore, ‘within an entity of interacting parts, no part can be changed without triggering changes all over the whole. This means that we need to solve the decisive problem of how the order and organization unifying the parts affects the behaviour of the whole system’ (Hjorth and Bagheri, 2006, 75). This latter observation is equivalent to the ‘whole is only as good as the sum of its parts’. Indeed this study focuses on the local system of sustainability and whether one component, namely renewable energy and wind turbines, fits into that local system of sustainability for the subsequent and assumed benefit to the global system of sustainability. An assessment of how the order and organization unifying the local part affects the behaviour of the whole system cannot be addressed within this study due to insufficient information therefore, only analyses a component of the local sustainability system.

2.2. Participation and Planning
In Wales, there are two fundamental planning processes, firstly the plan-making process and secondly the decision-making process. Public citizens are consulted within a planning process albeit at specific times and for given time periods. Firstly, the public are consulted on the Development Plan which sets the policies and criteria which control development for the local planning authority area, such as Powys County Council area. The other opportunities for public consultation within a planning process is during a planning application which is assessed against Development Plan policies and criteria (amongst other material considerations, see section 3.3) to determine whether to accept or reject an application. Therefore by involving the public via consultation within planning processes recognises the principle of democracy demonstrating that land use is decided in the public interest.

Academic literature refers to participation as a ladder where each step is one approach to involving stakeholders including public citizens. ‘Public participation ranges from state control and informing the public through to citizen control of budgets and policy making’ (Arnstein, 1969 in: Connelly and Richardson, 2004, 5). Generally there appears subtle differences between the approach of participation on one step compared to the next. As examples, a few steps can be identified as ‘consensus building’ which seeks to develop partnerships with as many stakeholders and agencies in the planning process as possible to build consensus on the appropriate outcome (Connelly and Richardson, 2004); ‘communicative planning’ which derives outcomes through debate and quality of opposing argument with the planner deciding the planning outcome (Fischler, 2000); closely related to communicative planning is ‘collaborative planning’ which focuses citizen and stakeholder involvement in a network rather than a hierarchical structure (Agger and Löfgren, 2008) orientated toward a negotiated consensus with the planner creating a forum enabling ‘non-hostile discourse among equals’ engaging citizens and other stakeholders including statutory consultees such as the Environment Agency (Brand and Gafflikin, 2007 in: Seltzer and Mahmoudi, 2012, 4). Arguably less participatory in nature is
‘consultation’ where information is provided to citizens and stakeholders about the Development Plan or planning application in question and seeking views and opinions within a formal consultation time period (Aitken, 2010). Such comments may be freely expressed by stakeholders but not necessarily freely considered by the decision-maker as there are topics and subjects often disregarded because they are deemed beyond the meaning of ‘material considerations’ (see section 3.3) therefore considered outside the planning system. Each step of the participation ladder requires a time period for each approach to work effectively, so collaborative planning requires more time to be effective than consultation perhaps resulting in different planning outcomes. However, lengthy and complex consultation can lead to consultation fatigue while still failing to engage citizens effectively (McClymont, 2011).

Across the literature, participatory methods require involvement which is inherently political and an ongoing process. ‘Citizen participation is not just one thing, one practice, associated generally with planning. Rather, citizen participation is a variety of approaches and practices associated with key decisions and judgments entered into from the moment that a planning problem is conceived’ (Lane, 2005 in: Seltzer and Mahmoudi, 2014, 4). The underlying assumption appears that ‘greater public participation in decision-making processes will lead to more socially acceptable and hence sustainable outcomes. However, projects or decision-making processes which make claims to being participatory do not always accurately reflect public interests and participants do not necessarily play influential roles’ (Aitken, 2010, 249). Leino and Laine (2011) observe that people participate in planning processes because they are interested in a particular issue. However, ‘an important area of consideration is who participates, and equally who does not participate, critical attention must be paid to which voices dominate participatory processes’ (Aitken, 2010, 250). Despite democratic principles of participation within planning processes, it seemingly remains difficult to accurately reflect the overall public interest.

Structures of planning power through for example language and knowledge legitimacy exemplified in lay person versus expert knowledge (Aitken, 2010) appear problems within current planning processes leading to what Pepermans and Loots (2013) term political and social distance. The former refers to the degree of alienation between communities and the decision-makers, whereas social distance refers to the degree of alienation between communities and developers of economic activities. They argue such distances must be reduced within planning processes in order to enable proactive involvement within a framework of collaborative planning. Further to citizen alienation, Wolsink (2007) has criticised the planning application process where the public are consulted on a fixed plan, creating a model of ‘develop, announce and defend’ acting as a ‘trigger for opposition than an incentive for the proper design of acceptable projects’ (Wolsink, 2007, 1205). Both studies assert a move away from top-down processes of consultation to more bottom-up and collaborative participatory and proactive processes working toward agreement and consensus. This paradigm shift appears more important in a planning system geared toward sustainable development.

2.3. Renewable Energy
Arguably, ‘all natural resources are, in theory, renewable but over widely different time scales. If the time period for renewal is small, they are said to be renewable. If the renewal takes place over a somewhat longer period of time that falls within the time frame of our lives, they are said to be potentially renewable. Since renewal of certain natural resources is only possible due to geological processes which take place on such a long time scale
that for all our practical purposes, we should regard them as non-renewable’ (Afgan et al, 1998, 237). Science and technology has provided numerous options for generating renewable energy including solar panels, hydro-electricity from rivers and tidal sea power, and wind turbines both onshore and offshore. Amongst others, these options are technically possible today and likely form part of our future toward sustainability. Advantages and disadvantages exist with all these technologies from their input materials to their ultimate use in the landscape. Nevertheless, renewable energy installations are increasing globally (Ren21, 2013) and European Member States have pursued various strategies from micro-generation to offshore tidal projects including Pentland Firth tidal turbines (BBC, 2013).

2.3.1. Actions, Arenas and Resources

Renewable energy is considered an important part of sustainable development for reasons relating to mitigation of climate change, reduce dependence upon fossil fuels and securing future energy security (Lior, 2010). Within sustainability, renewable energy is commonly referred to as sustainable energy development to which the WCED (1987) ’provided four key elements of sustainable energy:

1) sufficient growth of energy supplies to meet human needs [...] :
2) energy efficiency and conservation measures, in order to minimise waste of primary resources;
3) addressing public health and safety issues where they arise in the use of energy resources; and
4) protection of the biosphere and prevention of more localised forms of pollution’ (Jefferson, 2006, 573).

Within the phrase, ‘act local, think global’ the supposed onus upon locals to act locally is dependent on the boundary of what is ‘local’. Since the internet and other media, the ‘local’ does not necessarily mean spatially close as citizens can now ‘act locally’ in many more ways than historically. This means individuals rejecting energy production in their spatially close community council area/arena may be prepared to contribute resources (knowledge, expertise and/or money) over the internet to renewable technologies that can be implemented elsewhere, but give more CO$_2$ reduction per resource unit sacrificed. Citizens and businesses can and are doing this, addressing the four key elements of working toward sustainable energy development using all sorts of actions, arenas and resources. Examples of some of the many arenas individuals are acting ‘locally’ include household energy conservation, crowdsourcing, crowdfunding and project shares, and offsetting carbon emissions.

Homeowners are acting toward energy conservation simultaneously reducing household costs using renewable materials including sheep wool or straw for insulation, and installing recycling methods including recycling rainwater. Nowadays, buildings are encouraged to have direct interactions with the environment to conserve energy they use but also reduce global warming and environmental pollution. Examples of where individuals can and do act in this local ‘household’ arena include, surface treatment and orientations that reduce household absorption of solar energy and increase its reflection (help mitigate “heat islands”), use of plants (green roofs) to absorb CO$_2$ and grow usable produce, surface treatments to absorb some pollutants, recycling water, and collecting rainwater (Lior, 2010).
Crowdsourcing is ‘finding what you need not internally or from traditional vendors, but from people loosely affiliated through the Internet’ (Seltzer and Mahmoudi, 2012, 7). This technique has and is used regularly on the internet to bring together knowledge and expertise from different people to develop a project. The idea is an individual living elsewhere in the world can provide knowledge and expertise to support a local scheme in another country over the internet. This recognises the value in the public to solve problems as a group, and secondly places responsibility on project individuals to implement a project. Wind turbines are an example of a crowdsourced project (see, CRIDA wind co-operative, 2014).

Crowdfunding is different from crowdsourcing because only money is required from individuals to enable a project to be developed and implemented by a group of individuals who proposed the idea. Typically this is an internet based method therefore appeals to individuals from all over the world to raise money for a specific project such as solar roadways (see, Indiegogo, 2014). Purchases into projects can be via loans where the participant seeks a percentage return on investment over a given time period, shares where the participant receives dividend payments based on their shareholding, or donations where the participant seeks no monetary return for their purchase.

Offsetting carbon emissions is increasingly the practise of multinational companies providing opportunity to consumers to offset carbon emitted whilst using the service. An example includes SAS airlines (2014) providing another arena in which individuals are acting locally toward sustainability.

It could be argued particularly using the crowdsourcing and crowdfunding methods, that monetary return is a motivator to act within these arenas. However, firstly, these different arenas enable anyone with internet access the opportunity to support projects anywhere in the world. Secondly, individuals who object to a nuclear power station or wind turbines in their community council area/arena may be prepared to contribute resources (knowledge, expertise and/or money) to renewable technologies more usefully implemented elsewhere, giving more CO₂ reduction per resource unit sacrificed, therefore more worthy of the individuals support. Presently, motives for individual actions in such various arenas are currently under researched.

Individuals may not support projects with the specific intension of working toward sustainability. Nevertheless, supporting and implementing these projects arguably has the subsequent effect of taking steps toward ‘a sustainability’ of sorts. Where individuals do not support a project or scheme, this does not mean they are opposed to the goal of global sustainability, nor sustainable energy development, nor indeed the projects themselves. The same can be said for this study which uses wind turbines as an indicator of whether there is a tension of acting locally within the community council area/arena for subsequent global benefit. In this study, where local people are opposed to wind turbine development within their community council area/arena, it may be that these individuals feel they are already doing enough by acting in other ways. Opponents to local wind turbines does not mean those people become opponents to local sustainability or global sustainability. Rather, it simply suggests that alternatives’ may be preferred and could ask the same person/community to act locally in various other ways.

2.4. Wind Turbines
Academic literature has broadly reported national opinion polls to have positive public attitude toward renewable energy using wind turbines in preference to fossil fuels,
examples include Canada (79%), UK (80%) and 82% in Denmark (Devine-Wright, 2005). However, here lies the tension or ‘social gap’ (Hall et al, 2013) that whilst many people at a national level express desire for wind energy, wind turbines need to be installed in a ‘local’ producing local level conflict. Academics have denoted this tension ‘NIMBYism’ (Not In My Backyard-ism) with local opposition attributed to self-interest whose NIMBY sentiments imply people have no objection to an activity or technology (or even support it) provided it does not negatively affect their personal living environment. However regarding wind turbines, this assumption has no empirical evidence (Pepermans and Loots, 2013; Devine-Wright, 2005) nevertheless hampers the vision of planners, investors and policy-makers (Wolsink, 2007). Rather, positive gains through lower greenhouse gas emissions are perceived to occur on national and international scales, while negative impacts, including noise and aesthetic changes, are obvious to local people resulting in a binary tension of local risks/costs versus global benefits (Hall et al, 2013).

2.4.1. Scale of Turbine Development

Regarding wind turbine height and number, academic research has found scales’ of wind turbine development broadly considered acceptable in various countries, though seldom the same across all countries. Results consistently suggest smaller-scale developments are more positively perceived in comparison with larger-scale developments (Devine-Wright, 2005). Specifically regarding wind turbine number within the UK, results show a negative linear relationship between wind farm size and public support where support was highest for wind farms with less than eight turbines (Lee et al, 1989 in: Devine-Wright, 2005). In Denmark, Ladenburg and Dahlgaard (2012) show respondents who see more than 20 turbines daily are equally negative as respondents who see 5 turbines daily. Accordingly five or more turbines representing an apparent cumulative threshold (Ladenburg and Dahlgaard, 2012). Conversely in Ireland, perceptions of different sized wind farms in different landscape settings were examined. Regarding upland and farmland landscapes, respondents perceived smaller-sized wind farms more favourably than larger-sized farms (Sustainable Energy Ireland, 2003 in: Devine-Wright, 2005). Overall such studies are important for indicating the manner in which several variables interact to produce public perceptions of impact specific to their landscape contexts (Devine-Wright, 2005).

Regarding wind turbine distance, it stands to reason that one’s proximity to a wind turbine would be an important factor affecting public opinion (Bidwell, 2013). However research results are inconsistent, Warren et al (2005) in Ladenburg and Dahlgaard (2012) found attitude towards wind turbines became negative the further people live from two onshore wind farms in Ireland. In contrast, Swofford and Slattery (2010) in Ladenburg et al (2013) surveying local communities in Texas, USA found the opposite, more negative attitude with more turbine proximity. Whereas, Johansson and Laike (2007) in Ladenburg et al, (2013) in their Swedish study found distance did not influence attitude significantly. Thus, previous results are varied, giving insight into the difficulty in handling the spatial distribution of wind turbines. Understanding relationships between turbine distance and public attitudes may not be as simple as this binary approach. Ladenburg and Dahlgaard (2012) suggest the effect on attitude may also be influenced by the cumulative number of turbines experienced. The study showed seeing 6 turbines daily was related to negative attitude, and seeing more than 6 made no further difference to the negative attitude.
Temporal studies of acceptance to understand attitudes toward wind turbines at planning, construction and completed stages reveal contrasting results. Broadly, public acceptance is expected to increase after construction (Figure 3).

**Figure 3.** Local level wind turbine acceptance before, during and after construction (Gipe, 2005 in: Devine-Wright, 2005, 132).

This is not always the case. Cited in Devine-Wright (2005) Bishop and Proctor’s (1994) longitudinal study of public perceptions of three Welsh wind farms before and after construction reported an improved approval from an average of 41% beforehand to 66% afterwards. This general increase masked large variability across the three sites. At two sites, the proportion of respondents with negative perceptions of development actually increased (Llandinam from 12.1% to 22.7% and, Rhyd-y-Groes from 29.8% to 35.1%). As aforementioned, Ladenburg and Dahlgard (2012) suggest the distance and number of turbines experienced can influence attitude thus, it does not necessarily stand to reason public acceptance increases with more familiarity and exposure to wind turbines’. Equally, there are numerous other influences shaping people’s attitudes requiring further research on how familiarity shapes perceptions, unpacking issues of knowledge and prior experience, and risk perceptions associated with the unknown (Devine-Wright, 2005). The assumption of negative public perception improving over time is unsupported by empirical evidence with contextual influences specific to development in specific locations likely playing notable roles in shaping public perceptions than previously acknowledged in literature (Devine-Wright, 2005).

### 2.4.2. Public attitude and opinion toward effects of Wind Turbines

Wind power supporters perceive it an environmentally friendly sustainable source of energy in combating climate change and moving toward sustainability whilst opponents perceive it as an unwanted intervention, destroying landscapes and spoiling natural settings (Rygg, 2012). *Positive attitudes and opinions* have tended to focus upon employment, combating climate change, environmental enhancements through for example habitat provision, and community benefits. Employment is projected to increase as a result of wind turbine development both locally (Slattery et al, 2011) in terms of labour and office workers, and globally (Mostafaeipour, 2010) in terms of supply chain and manufacturing jobs. Wind turbine installations are expected to form part of the energy mix required to combat climate change and reduce CO₂ emissions (Mostafaeipour, 2010). Environmental enhancements through habitat provision acknowledges there may be site impacts but these will be compensated and more by enhancing habitats elsewhere (Powys County Council, 2012b). Also, community benefits providing sums of money to community funds (Munday et al, 2011) could be used for community facilities and provide grants for education amongst other uses. Community payment perceptions have been wide ranging,
from enhancing the community to being considered bribes which could be divisive in terms of local in-community and intra-community place relationships (Cass et al, 2010).

Regarding community scale turbine projects, Denmark has had a long history of installing locally controlled wind turbines and has succeeded in establishing a world class wind turbine industry (Buen, 2006 in: Rygg, 2012). Part of this success has been because decisions made at local levels provide options for locals to become involved in wind projects creating positive attitudes and opinions (Wolsink, 2007). Maruyama et al (2007) develops the idea of positive attitude motivators in a Japanese study of community scale wind turbine projects finding motivators include environmental aspect of using renewable energy, stimulating the local community, and self-fulfilment by participating. The study concludes not only environmental, economic and social aspects of sustainable development are fulfilled, but also the psychological and moral values including consciousness, participation, compassion and cooperation can activate progress toward a sustainable society. Advantages and disadvantages of renewable energies were dynamically constructed by social systems, and strongly affected the social acceptance of new energy technologies. Anderson et al (1997) in Devine-Wright (2005) found other positive attitude motivators included people who own shares in a turbine are significantly more positive toward wind energy than people with no economic interest in wind turbines. Additionally, members of wind co-operatives are more willing to accept further turbines in their locality compared to non-members. However, with increased political pressure by the Danish government on the local to accept onshore wind turbines Denmark is now struggling to install further onshore wind power due to conflicts regarding noise, land use, and visual impact (Meyer, 1995 in: Rygg, 2012).

Negative attitudes typically emanate from local conflicts, not confined to Denmark. Regarding house prices, Sims et al (2008) analysed 201 sales transactions from houses situated within half a mile of a 16 turbine wind farm all 60 metres tall in Cornwall, UK finding no relationship between the number of wind turbines visible and a reduction in housing value, nor between distance to the wind farm and house price. However, the rateable value of one farmhouse had been reduced by one rating band due to turbine blade flicker. Results suggested certain vistas can inflate or diminish house price and landscape may have intrinsic value to communities and individuals which was not captured in the analysis. Other areas of conflict/concern typically relate to human health, community conflict (Baxter et al, 2013), impact on tourism (Powys County Council, 2012b), the local economy, transport and traffic movements, ecology, protected habitats and species, landscape value and visual impact (Wolsink, 2007), noise, shadow flicker, built and cultural heritage, hydrology, hydrogeology, pollution, environmental health, electromagnetic interference and aviation, grid connection and transmission lines, rights of way and bridleways, health and safety and carbon balance (Powys County Council, 2012b).

Local concerns appear to represent barriers to wind turbine development, which is understandable in the context of a top-down push for turbine installation by national governments coupled with the context people are accustomed to getting their electricity. Pasqualetti (2000) in Devine-Wright (2005) suggests renewable energy development poses moral difficulties for communities since it cannot presently be stored but requires local development to exploit local resources. This is very different to traditional energy developments including power stations which are concentrated in small areas with large scale infrastructure using fossil fuels and uranium which can be transported. Power stations are located far away from large swathes of the population thus, Pasqualetti (2000) in Devine-Wright (2005) asserts the ‘out of sight, out of mind’ experience whereby the
public, accustomed to not seeing energy being produced, is now faced with accepting energy production much closer to home.

2.4.3. Areas of Interest

Research question C focused upon local public attitudes regarding the contribution wind turbines make toward sustainable development as indicated by the EC (2011) SDS: Monitoring Report. Question C is simply tested and presented as an idea in this study.

Both positive and negative attitudes abovementioned including proposed positive employment gains and proposed negative effect on tourism quite reasonably fall within sustainable development. Nevertheless, this study concentrates on 6 indicators of sustainable development (Table 1), namely, employment, education, population, human health, climate change, and transport and mobility. The contribution wind turbines could make toward effecting population and education appears not to have been widely considered within literature which appears reasonable as wind turbines are not anticipated capable of directly effecting education level or population movements. Wind turbine developments may well be capable of indirectly effecting education and population, an example could include the provision of community benefits to affected communities may lead to an increased desire to move within the affected community seeking the benefits of community payments.

Employment, human health, transport and mobility, and climate change have been considered in the literature and in planning decisions’ with education also considered in the former. Due to wind turbine development, employment is expected to increase and based on past growth rates where employment in the global wind sector increased from 235,000 in 2005 to 440,000 in 2008, most of them highly skilled jobs (Mostafaeipour, 2010).


Transport and mobility is considered to be negatively affected regarding traffic movements during turbine construction and decommissioning phases for higher numbers of larger turbines using abnormal indivisible load methods of transporting turbine components (Powys County Council, 2012b). However to access wind turbine sites with large scale turbine components, infrastructure commonly requires improvements and enhancements (ibid, 2012) which is positive for some local communities.

Combating climate change, simultaneously reduce global dependence upon finite fossil fuels appears the main function of developing renewable energies (Mostafaeipour, 2010). ‘Developing the public’s understanding of the need for new technologies to combat climate change and gain societal acceptance of renewable energy technologies is important [...] in determining the eventual mix of technologies adopted’ (Hall et al, 2013, 201). In a planning application, wind turbines are assessed in terms of CO₂ emissions avoided compared to
the average ratio of electricity generated to CO\textsubscript{2} emitted of 0.43, essentially comparing pollution per unit of power generated. Thus, a proposed wind farm of 29x2.3MW turbines generating 175,200MWh/y would avoid approximately 75,336 tonnes of CO\textsubscript{2} per year (Powys County Council, 2012b).

One study in Texas, USA suggests education was a positive consequence of wind turbine development. Kahn (2013) compared three sets of schools, the first set located in three wind farm counties. The second set were schools located in five nearby counties and the third set were all other Texas schools. Schools were compared at elementary, middle and high school tiers of education. The study reported schools in wind farm counties’ had improved over time based on expenditure per-pupil increasing and the student–teacher ratio decreasing. In 2008, the average school in wind farm counties spent $1364 more dollars per-pupil than the average school in Texas, and in 2010 this difference was $1239, both statistically significant. Even schools in the five ‘nearby’ counties had higher per-pupil expenditure, $678 more than the average spent per-pupil in Texas. Conversely, in both 2008 and 2010 there was no statistically significant difference between the student teacher ratio in all of Texas with nearby non-wind farm counties suggesting such schools were close to or were ‘average’. The study suggests counties with major wind farms invest more in their public schools because such counties collect higher tax revenues as a consequence of turbine developments enabling greater per pupil investment. Further study is required to understand whether higher per pupil investment in this context translates into higher grades attained compared to the average school in Texas. Equally, authorities who receive the higher tax income make the decision to invest into schools suggested in Kahn (2013). Such money could have been invested in libraries or hospitals as other options.
CHAPTER 3–LAW AND POLICY

‘No snowflake in an avalanche ever feels responsible’

Stanislaw Lec (unknown)

Rationale for this chapter is because awareness of the present legal and policy framework/system is important to understand the context of how sustainable development works toward achieving sustainability. The European Union (EU) is increasingly influential upon Member State law and policy. Land use under UK Planning Acts as apply to Wales is being influenced by the EU and, sustainability and sustainable development are increasingly cited within Member State law and policy. The legal and policy framework within which sustainability is supposed to be achieved could be a hindrance or boost for sustainable development processes toward achieving sustainability.

Pertinent law and policy are reviewed following a 4 tier hierarchy beginning with law and policy in the European Union, secondly considering the United Kingdom, thirdly considering Wales, and finally the policies specific to the County of Powys. The primary purpose of this chapter is to understand how sustainability and sustainable development is understood and applied within the law and policies controlling Town and Country (land use) Planning in Wales. The secondary purpose of this chapter is to understand the law and policy context in which wind turbines, a component of renewable energy and therefore a component of sustainability and sustainable development, are applied in Town and Country (land use) Planning in Wales.

At all 4 tiers, a plethora of law and policy interlinked vertically and horizontally exists which relate to the topics covered within this study including sustainability and renewable energy amongst many others. However, a substantial amount of existing law and policy at all 4 tiers will be absent from this review as this study focuses upon the primary and secondary purposes aforementioned. Pertinent law and policy is considered regarding renewable energy and wind turbines given wind turbines is the only selected indicator of whether or not there is a tension between thinking global when acting local in this study.

Each hierarchy tier has a flow-chart of what is reviewed both land use planning and sustainability together as they are becoming increasingly interrelated in law and policy. Flow chart content will not be exhaustive for reasons abovementioned. Thus, flow charts’ must be viewed as simplified sections of a much larger detailed flow chart/framework in reality.

3.1. European Union

Law and policy at the European tier of the hierarchy is reviewed beginning with European Union treaties briefly outlining relevant key points before considering the European Union (2006) Sustainable Development Strategy and finally considering the Renewable Energy directive in the context of sustainable development (Figure 4).
Sustainable development is cited as a principle within the TEU preamble, cited a further 3 times within the TEU and cited 1 time in the TFEU. The meaning of sustainable development within the treaties is recognised in the contexts the phrase is cited. The TEU preamble notes, ‘determined to promote economic and social progress for their peoples, taking into account the principle of sustainable development and within the context of the accomplishment of the internal market and of reinforced cohesion and environmental protection, and to implement policies ensuring that advances in economic integration are accompanied by parallel progress in other fields’ (European Union, 2012, 15). Sustainable development is cited within the context of economic and social progress, accomplishment of the internal market ensuring the freedom of movement of goods, persons, services and capital (TFEU Article 26(2)), environmental protection, and ensures economic integration advances are paralleled in other fields. Wording here recognises the multifaceted nature of sustainable development which is not just about the environment, it is equally about social and economic facets.

Taken together, the preamble and TEU Article 3 suggest sustainable development is a central organising principle toward achieving European Union objectives which is affirmed
Sustainable ‘land use’ Development
Paul Watson

in the EU (2006) SDS noting, sustainable development ‘is an overarching objective of the European Union set out in the Treaty, governing all the Union’s policies and activities’ (Council of the European Union, 2006, 2).

The leading policy document of the European Union on sustainable development is the EU (2006) SDS. The document establishes key objectives including environmental protection, social equity and cohesion amongst many others with accompanying policy guiding principles toward achieving those objectives. The document writes the objectives as challenges outlining 7 key challenges:

1) Climate Change and clean energy: limit climate change and its negative effects to society and the environment;
2) Sustainable Transport: ensure our transport systems meet society’s economic, social and environmental needs whilst minimising undesirable impacts on the economy, society and the environment;
3) Sustainable consumption and production: promote sustainable patterns;
4) Conservation and natural resource management: improve management and avoid overexploitation, recognising the value of ecosystem services;
5) Public Health: improve public health and protection against health threats;
6) Social inclusion, demography and migration: create socially inclusive societies taking into account solidarity between and within generations, and secure and increase quality of life as a precondition for lasting individual well-being;
7) Global poverty and sustainable development challenges: actively promote sustainable development ensuring consistency of the European Union’s internal and external policies with global sustainable development and its international commitments.

Included within this study but called ‘areas of interest’ (Table 1) for question C are Climate change, Transport and mobility, Human health, and Education making up 4 of the 7 challenges of sustainable development. The EU (2006) SDS is monitored with the European Council Sustainable Development Strategy: Monitoring Reports, published every two years. A European Council Sustainable Development Strategy: Monitoring Report (hereafter, EC (2011) SDS: Monitoring Report) was released in 2011 with 10 main chapters comprising headline indicators and subthemes of sustainable development. The 6 sustainable development indicators specifically fall within a theme of the EC (2011) SDS: Monitoring Report (see table 1) to address question C (6.3). One component of the EU (2006) SDS is reducing dependence on finite fossil fuels simultaneously mitigating climate change through increasing supplies of renewable energy. The European Union has a law to increase the proportion of energy supplied from renewable energies.

European law on renewable energy is contained within Council Directive 2009/28/EC hereafter, the ‘Renewable Energy Directive’. Article 3(1) has established at least 20% of all energy consumed must be from renewable energy sources by 2020. As per Article 288 TFEU, directives are legally binding on Member States only regarding the result to be achieved, leaving Member States the choice of ‘form and methods’, choosing how to achieve the result (European Commission, 2012). Member States are free to pursue their course of action to achieve the overall target with the UK establishing considerable law and policy regarding renewable energies and wind turbines broadly; though mainly through the land use planning system called the UK Town and Country Planning system.
3.2. United Kingdom
To meet EU (2006) SDS commitments and the Renewable Energy Directive target, the UK has added a plethora of legal and policy instruments to enable action toward these EU objectives. This appears the case despite the lack of cross-reference to the EU (2006) SDS in UK law and policy documents. Figure 5 is not exhaustive, merely considers directly relevant UK law and policy to this study.

Figure 5. Flow chart displaying relevant UK law and policy basis for this study.

Figure 5 shows the UK Sustainable Development Strategy (hereafter UK SDS) drafted by DEFRA which is presented here as background. It is not considered elsewhere as this study uses the EU SDS instead. The reason the EU SDS is used is based on the use of sustainable development in Treaty Article wording. Article 4(3) defines ‘sincere cooperation’, and makes only one distinction, that Member States ‘...ensure fulfilment of the obligations arising out of the Treaties or resulting from the acts of the institutions of the Union’ (European Union, 2012, 18). Sustainable development would appear to be an ‘obligation arising out of the treaties’ meaning that where the UK SDS does not agree with the EU SDS, the principle of sincere cooperation steps into effect to make EU SDS the superior SDS from which all Member States must depart. It may be the case the EU SDS is not the sustainable development trajectory desired by UK government. Irrespective, the wording of the Treaty Article appears clear. Therefore, given any inconsistency between Member State SDS and EU SDS, the EU SDS is supreme, it was considered more relevant to assess sustainable development against EU sustainable development indicators.

The UK SDS is a policy document born in 1999. Successive changes in UK government have changed the UK SDS to suit their own purposes therefore, the most recent UK SDS is the 2011 document (DEFRA, 2011) with the Conservative and Liberal Democrat coalition government established in 2010. Monitoring sustainable development progress,
the UK SDS has a set of 35 sustainable development indicators (hereafter, SDI) with 66 measures. DEFRA (2013) contains the SDI monitoring report which interestingly does not mention the EU SDS. Nevertheless, SDI in both the UK (2013) SDS and EC (2011) SDS: Monitoring Reports are similar although monitored at different spatial scales.

Law and policies are for the most part ‘procedural’ in terms of what can be considered within the planning system of what is sustainable development, they do not comment substantially on the ‘substance’ of sustainability or sustainable development within the planning system. United Kingdom law relating to sustainable development and sustainability as applied to Town and Country (land use) Planning in Wales is found in several planning laws although two of the main laws are the Planning and Compulsory Purchase Act (2004) and the Planning Act (2008) both applicable in Wales.


Section 10(2) and (3) on sustainable development within the Planning Act (2008) apply to National Policy Statements noting,

‘(2) The Secretary of State must, in exercising those functions, do so with the objective of contributing to the achievement of sustainable development.
(3) For the purposes of subsection (2) the Secretary of State must (in particular) have regard to the desirability of—
(a) mitigating, and adapting to, climate change;
(b) achieving good design.'

Criteria for assessing whether a development under National Policy Statement falls within sustainable development include whether it helps work against climate change, and good design. EN-1 develops good design insofar as referring to ‘impact’ (DECC, 2011a, 4.5.2), where there is an impact then change the design. This appears at odds with the concept of sustainability which seeks to understand the ‘effect’ of actions on our surroundings (social, economic and environmental). Additionally, the word ‘impact’ assumes that decision-makers know every conceivable facet of the development to determine whether an ‘impact’ is likely. If they do not know about a facet of the development, they do not know whether there will be an impact. However, 4.5.3 develops good design insofar as taking into account ‘both functionality (including fitness for purpose and sustainability) and aesthetics (including its contribution to the quality of the area in which it would be located) as far as possible’ (DECC, 2011a). Perhaps this is where local knowledge appears valuable and could inform this decision-making process to achieve an acceptable locally sustainable outcome.

Sections’ within the Planning and Compulsory Purchase Act (2004) are reviewed throughout the next two tiers, as it provides law and policy pertinent to Wales and Powys.
3.3. Wales
The Planning and Compulsory Purchase Act (2004) is reviewed firstly, then law and policy emanating from the Government of Wales Act (2006). There appears a cross-reference link between the planning system and the scheme of sustainable development currently pursued by Welsh Government, and there appears an inferred cross-reference link between the Future Generations Bill (2014) and the planning system. Continuing from the UK tier, figure 6 shows Welsh law and policy which is not exhaustive.

![Flow chart showing pertinent Welsh law and policy basis for this study.](image)

Section 60(2) Planning and Compulsory Purchase Act (2004) provides for Welsh Government policy-making regarding development and use of land (Town and Country Planning) in Wales. These documents are the Wales Spatial Plan and Planning Policy Wales (hereafter, PPW) which form Welsh Government policy on Town and Country Planning in Wales. Welsh Government also ‘supplements’ PPW by adding Technical Advice Notes (hereafter, TANs) for example Technical Advice Note 8: Renewable Energy (2005) (hereafter, TAN8) which effectively become appended to the main PPW document.

Welsh energy policy derives from TAN8 (2005) which asserts a renewable energy production target of 7TWh of electricity per annum by 2020. To meet this target, Welsh Government concluded 800MW of additional installed capacity is required from onshore
wind sources and a further 200MW of installed capacity is required from offshore wind and other renewable technologies (Welsh Assembly Government, 2005).

When deciding whether to accept or reject a planning application, section 38(6) Planning and Compulsory Purchase Act (2004) establishes the decision-maker (planning authority or Secretary of State) considers 'material considerations' when deciding whether to accept or reject a planning application. It notes,

‘If regard is to be had to the Development Plan for the purpose of any determination to be made under the Planning Acts, the determination must be made in accordance with the Plan unless material considerations indicate otherwise’ (section 38(6))

Therefore decisions on planning applications are made based on Development Plans (Powys tier of the law and policy hierarchy) unless material considerations (including the Wales Spatial Plan, PPW and all the TANs, amongst others) indicate otherwise. Thus, TAN8 is a material consideration when determining planning applications which has been maintained at planning appeals (see Planning Inspectorate, 2014).

Stringer v. Minister for Housing and Local Government, held by the English High Court in 1970 cited in Little (1983), provides a definition of ‘material consideration’. The case concerned an agreement designed to prevent development interfering with the working of the Jodrell Bank radio telescope. Regarding material considerations, the judge said,

‘it may be conceded [...] material considerations to which the Minister is entitled and bound to have regard in deciding the Appeal must be considerations of a planning nature. [...] In principle it seems [...] any consideration which relates to the use and development of land is capable of being a planning consideration. Whether a particular consideration falling within that broad class is material in any given case will depend on the circumstances. However, [...] in considering an Appeal the Minister is entitled to ask himself whether the proposed development is compatible with the proper and desirable use of other land in the area. For example if permission is sought to erect an explosives factory adjacent to a school the Minister must surely be entitled and bound to consider the question of safety. I find it equally difficult to accept that the Local Planning Authority and the Minister on Appeal must have regard only to public interests as opposed to private interests. [...] it would be impossible for the Minister and Local Planning Authorities to carry out their duties as custodians of the public interest if they were precluded from considering the effect of a proposed development on a particular piece of land by a particular occupier in the neighbourhood. The public interest, as I see it, may require that the interests of individual occupiers should be considered. The protection of the interests of individual occupiers is one aspect and of importance to the public interest as a whole’ (Little, 1983, 172).

A decision-maker (planner) must make a decision in line with policies of the Development Plan. If material considerations indicate otherwise, these are used to reach a decision. A vast number of cases exist regarding what is and is not a material consideration in specific planning contexts. However, it remains a question of context whether particular considerations become relevant to a particular planning application for two lines of reasoning from the above, firstly whether the proposed development is compatible with proper and desirable use of other land in the area, and secondly contesting that regard is
had only to public interests as opposed to private interests. The judge develops this second point noting, ‘protection of the interests of individual occupiers is one aspect and of importance to the public interest as a whole’. Arguably, Town and Country Planning is an imperfect science somewhat reflected in the imprecise nature of material considerations.

Relating this decision-making process to sustainable development, it is important to note that section 39(2) Planning and Compulsory Purchase Act (2004) places a duty upon persons or bodies to exercise their functions (including planning decisions as described above, development documents, and Wales Spatial Plan etc) with the objective of contributing to the achievement of sustainable development. However, no definition is provided for what is or is not sustainable development within law. Presumably, the idea behind this legal provision is that if planning application decisions are based on Development Plan documents such as PPW and local development plans, and those plans are considered ‘sustainable’, surely the decisions based on them will be sustainable as well. Theoretically this makes sense however, public opinion perhaps indicates otherwise.

Regarding the decision-making process, the Town and Country Planning (Development Management Procedure) (Wales) Order, 2012 establishes the process for accepting or rejecting planning applications to develop land in Wales in accordance with the development plan or material considerations. In terms of consultation, section 16(1) notes a 14 day consultation period for Town and Community Councils, and section 21(1)(a) notes a 21 day public consultation period for the application once a site notice has been displayed. Indeed section 22(2) notes the decision to accept or reject the planning application must be made within 8 weeks of receiving a valid application. These time periods appear short, and consequently appear incompatible with working toward local sustainable development when making a decision in the public interest now and for future generations. Such short timescales for citizen involvement and planning decisions could leave citizens alienated from the process and any eventual outcome which appears incompatible with sustainable development when seeking the sustainability goal.

Welsh Government law and policy regarding sustainable development emanates from the Government of Wales Act (2006) where section 79(1) provides for a sustainable development scheme setting out how Welsh Ministers propose, in the exercise of their functions, to promote sustainable development. Subsequently, in 2009 the Sustainable Development Scheme was published with 18 actions toward sustainable development (Welsh Assembly Government, 2009). The document refers to the EU SDS noting, ‘the EU Sustainable Development Strategy priorities are reflected in our Sustainable Development Scheme. These linkages will ensure there is coherence between EU policies and coherence between regional, national and global actions, in order to enhance their contribution to sustainable development’ (Welsh Assembly Government, 2009, 10). The most recent Welsh Sustainable Development Annual Report is for 2012-2013 which, like the UK SDI report makes absolutely no mention of the EU SDS, but does include the planning system when monitoring sustainable development (Welsh Government, 2013). The 7 indicators with a suite of sub-indicators used for monitoring the planning system only refer to ‘significant’ planning applications determined in Wales thus give a vague and faint insight into the contribution of the Welsh planning system toward sustainable development. This aspect of monitoring the Welsh Sustainable Development Scheme will likely be developed and progressed in future with the legal requirement for monitoring all planning applications.
The sustainable development white paper, now the ‘Future Generations Bill’ was released for public consultation in December 2012. Presently it is unclear whether the bill will influence the Welsh Planning System although does note it will apply to integrate the three dimensions of sustainable development in decision-making, and to public sector organisations in an effort to promote consistency of sustainable development application across organisations supported by a statutory sustainable development body (Welsh Government, 2012). Such public sector organisations’ would likely include Local Planning Authorities including Powys County Council suggesting the planning system will become part of working toward sustainable development in Wales.

3.4. Powys

There are no laws which only apply to Powys, neither is there a Powys-wide Sustainable Development Strategy. This is the level of the hierarchy where planning applications, whether for a house or a shed etc, actually get decided by Powys County Council, the local planning authority.

Powys County Council (a ‘local authority’) has a Development Plan (hereafter, DP) grounded in law by section 62, Planning and Compulsory Purchase Act (2004). The DP is produced by the local authority and comprises policies and criteria used to assess whether a development is acceptable in terms of land use within the County. In a planning application, after consultation with citizens and stakeholders, a decision is then made in accordance with the DP unless material considerations including PPW and TANs indicate otherwise (as abovementioned, see 3.3).

In a planning application, process is just as important as outcome for reasons relating to public consultation expressing views and opinions, professional advice consultation with appropriate personnel typically an ecologist, relevant Town and Community Councils, and land drainage engineer (amongst others). The aim of this process is to make the correct decision in the public interest on whether that piece of land in question is appropriately used for the structure whether a house, wind turbine, solar panel, school or shed etc being sought. In this way, the planning process involves the public in the activities of the private sector in the way land is used recognising the principle that land use is fundamentally in the public interest. Thus, private sector growth is moderated/tempered somewhat by the public sector to maintain a jointly agreeable outcome of development between private gains and public interest. Where law in combination with local level policy control (not necessarily manage) economic growth arguably can bring about a sustainable social, economic and environmental development.

Planning decisions involve a balance which appears tantamount to a ‘trade-off’ between social, economic and environmental facets and if one facet is to inhibit the proposal, it needs to have ‘impact’. A succinct example is a decision by the Secretary of State for Wales, considering a proposal for a 1000 cow dairy parlour. He summarised an 87 page report containing pros and cons of the proposal written by an objective professional Planning Inspector (Planning Inspectorate, 2013b) into 6 pages saying he understands the ‘considerable harm’ to the local area but on balance (tantamount to ‘trade off’), economic benefits outweigh the detrimental effects (Planning Inspectorate, 2013a). Indeed, European legislation focuses more on ‘impact’ regarding the environment in its Council Directive 2011/92/EU (EIA Directive) despite the wording ‘impact’ appears fundamentally against the substance of Article 191(2) TFEU where it notes the ‘precautionary principle’ in the same sentence as ‘preventative action’ (European Union, 2012). What seemingly becomes clear is that ‘effects’ and where they occur, whether local, national or global are
of greater value in assessing whether or not a proposed structure fits into sustainability. The magnitude or scale of such effects are seldom considered outside the ‘local’ by the planner, meaning the planner/decision-maker is completely clueless what the effects of the proposed structure on the land are beyond the spatially ‘local’ when working toward sustainable development. At this point there appears implied agreement and a level of consensus amongst academics who refer to the process of learned experiences as a way forward (see, section 2.1.2 above).

On face value, the decision made by the Secretary of State for Wales does not appear to contribute toward local sustainable development giving rise to a tension of what should be considered within local sustainable development. Who is involved, and who can justly speak to the heart of local sustainable development at present and for future generations. This in turn suggests the contribution the planning system is currently making toward sustainable development is completely in the eye of the beholder and not in the eye of locals who live with positive and negative consequences of local land use. It is in this tension that this study fits, asking locals what is local sustainable development using renewable energy and wind turbines as the chosen ‘real world’ topic, and secondly placing judgement of whether local sustainable development is occurring in the hands of local citizens.
CHAPTER 4–METHODOLOGY

‘Man is like every other species in being able to reproduce beyond the carrying capacity of any finite habitat. Man is like no other species in that he is capable of thinking about this fact and discovering its consequences’


In this study a mixed method approach was applied using qualitative and quantitative techniques therefore a brief overview of the applied methods is presented here before methodology details. The County of Powys in Wales was the selected sample area. All 110 Town and Community Councils are composed of elected volunteers to speak on behalf of their local community (Figure 7), together representing the views and opinions of 132,976 people in Powys (Powysi, 2013(a)).

Each Town and Community Council received 1 questionnaire (Appendix A) therefore representing an estimate or ‘proxy’ of public opinion in Powys. However, only 15 questionnaires were received providing the data and information for the study representing a response rate of 13.6%. Therefore, this study is not representative of Powys as a whole and only representative of the 15 Town and Community Council respondent sample from Powys.

As seen in appendix A, responses to questions were confined into boxes to help with the quantitative part by giving these boxes a number in a continuous manner called a likert scale. If there were 3 boxes on offer for a given question, the likert scale applied would be 1, 2, 3. Likert scales were applied to the response boxes in exactly the same way for all 15 questionnaires received making responses comparable and more importantly represent responses in graphs and tables, for example showing the frequency of a particular response to a question. By applying likert scales to responses, graphs and tables were produced enabling broad qualitative statements regarding attitude and opinions to be made about the 15 responses as a whole to address the aim (1.2). Additionally qualitative analysis of the responses was undertaken to see if a response to a question was related to the response in another question, for example, of the respondents who selected ‘Yes’ to renewable energy being a good method of energy production then, how many of those respondents also said wind turbines were a good method of energy production. This was considered important in evaluating the overall attitude and opinion.

Results are presented for research questions A and B and subsequently used to draw broad statements and conclusions to address the aim. Data to address question C was not statistically significant therefore only presented as an idea, denoted ‘proof of concept’ within the discussion.
4.1. Sample Area: County of Powys in Wales
The selected study area was Powys County in mid-Wales. Demographically, Powys has a population of 132,976 (Powysi, 2013(a)) 4.3% the population of Wales (Powysi, 2013(b)) in 5190km² (Powysi, 2013(c)) giving one of the lowest population densities in the UK at 26 persons/km². Politically, the people of Powys are represented by Powys County Council comprising 73 elected County Councillors who represent several Town and Community Council areas (Figure 7) within their constituency. There are 110 Town and Community Council areas comprising volunteer Town and Community Councillors who are elected to represent their community. Brecon Beacons National Park occupies 17.2% of the Powys area (Powysi, 2013(c)) and itself is a decision-making authority on matters relating to the national park including planning decisions.

Figure 7. Map of Town and Community Council Areas within Powys, Wales.

Powys is currently subject to a conjoined public inquiry regarding 5 wind farm applications’ (Banksolutions, 2014). Powys County Councillors rejected all the applications on various grounds (example of 3 rejections, Powys County Council, 2012a) giving rise to the public inquiry held by a Planning Inspectorate inspector. The inspector is an adjudicator of proceedings and writes an objective report based on presented evidence during the inquiry providing a recommendation to the UK Secretary of State for a final decision on the respective applications.

There appears a level of public acceptance regarding wind turbines in Powys as there have been 148 permitted applications from 2010 to 2014 across Powys. The public inquiry has drawn numerous public representations (Banksolutions, 2014) compared to other applications (Powys County Council, 2013) suggesting levels of public concern could be
related to scale of turbine development. Thus, the tension of acting local whilst thinking global appears present in Powys in the case of wind turbines’, subsequently making Powys a suitable area to analyse whether the tension exists. Results here may present a point in time indication of where Powys sits along the temporal graph of general acceptance (Figure 3).

4.2. Research Strategy
To meet this study’s aim (1.2), the methodological approach adopted is phenomenology using grounded theory and induction. Grounded theory ‘directs researchers to look for patterns in data so they can make general statements about the phenomenon they examined’ (Potter, 1996, 151). Within grounded theory, an inductive process was used meaning data gathering was carried out first, then used for the creation of general statements about the sample to answer research questions’ A and B. Induction is used as this study gathers data using a questionnaire before analysing the data to understand if a tension exists between acting local when thinking global (research question A). Questionnaire data also provides information whether there is a scale of wind turbine acceptance (research question B). This then enables conclusions based on results.

Question C is only a proof of idea/concept as the envisaged method was tested but did not work out therefore it is not a result. In attempting to address research question C, to some extent this study applies deduction as information is gathered within the questionnaire to test a null hypothesis (see 4.3.4) using 3 regression models. Deductive processes are usually accompanied by assumptions; some expectation of the outcome which is accepted or rejected by the results of the data (Potter, 1996). However, regressions as conceptually presented were exploratory consequently, there were no assumptions. The idea of the regressions was not to prove or disprove the hypothesis, the value is seeing the relative importance of each X variable (areas of interest/concern) using beta values (β) in explaining respondents tendency to select a point as the ‘minimum unacceptable’ wind turbine scale.

Phenomenology studies the experience of relationships between the individual and object. It is both ‘constructed’, meaning people are creators of a social world, and ‘intersubjective’, meaning people experience the world with and through others (O’Leary, 2004). Studying numerous individuals’ constructed meaning and intersubjective experiences contributes to building a big picture of the overall phenomena of a particular object. An example; calling upon attitudes and opinions of company managers to provide an understanding of a power phenomenon (O’Leary, 2004). Thus, phenomenology is included because firstly, this study examines individual responses (from Town and Community Councils) on whether there is a tension between thinking global whilst acting local (a phenomenon) when working toward sustainability (object in question A) and secondly, examines individual responses on whether there is a tension between thinking global whilst acting local when working toward sustainability using wind turbines (object in question B) to test that phenomenon. This study uses individual attitudes collectively consequently, places high value upon individual Town and Community Council responses to develop understanding of the broad phenomena.

Two main methods to understand phenomena include conceptual leverage and generalisation. Conceptual leverage involves ‘moving from concrete observations to explanations at a higher level’ (Potter, 1996, 126). Conceptual leverage takes data from responses and draws out attitudes, patterns, characteristics and commonalities. Such broad attitude patterns only apply to the sample and not to Powys as a whole.
**Generalisation** is commonly used where information from a sample of individual responses is said to be representative of the whole population from which the sample came. An example being UK political polls whereby a sample of 1,000 people are asked which way they would vote in an election. Results from that sample are then generalised to represent the voting patterns across the whole of the UK population (from one to many). No generalisations are made in this study though conceptual leverage is applied analysing whether there is a broad pattern of positive or negative attitude toward local development for a global community when working toward sustainability.

**Attitude measurement** is used as the strategy for deriving data on the ‘acting local whilst thinking global’ phenomenon. A questionnaire was used to obtain qualitative data on Town and Community council attitudes as an estimate of local public attitudes. An attitude is ‘a state of readiness, a tendency to respond in a certain manner when confronted with certain stimuli’ (Oppenheim, 1992, 174). Three components comprise an attitude at a point in time; beliefs (cognitive), feelings (emotional) and intents (action-tendency) (Oppenheim, 1992). Attitudes are commonly labelled including being strict, vegetarian or lazy amongst others although, of limited use in science as labels may not truly represent the individual attitude in question.

Attitudes are held with varying levels of importance/intensity and acted upon with greater or lesser vehemence. For example, animal rights maybe of passing interest to some whereas, to others it is important enough to protest and get involved in animal rights organisations (Oppenheim, 1992). Attitudes are formed, and informed as part of a range of facets leading individuals to a particular attitude disposition. To understand this, ‘social psychologists make a rough distinction between these different levels, calling the most superficial one ‘opinions’, the next ‘attitudes’, a deeper level ‘values’, and still deeper level, ‘personality’. These distinctions between different levels informing attitudes are thought of as more versus less enduring, deeper versus more superficial; relatively stable versus relatively changeable; and more general versus more specific. Furthermore, ‘[...] there are relationships [...] between these layers’ (Oppenheim, 1992, 176) represented by the tree model (Figure 8). Therefore, opinions and attitudes are not isolated from a deeper value system which inspires the individual to act with greater or lesser vehemence, or not at all at a point in time.
Having abovementioned vertical attitude formation relationships within individuals, attitudes are also horizontally related meaning, 'attitudes are acquired or modified by absorbing, or reacting to attitudes of others' (Oppenheim, 1992, 178). Therefore, one attitude cannot be isolated from others to which it is linked and correlated which may also be part of underlying value systems (Oppenheim, 1992). Interrelations of attitude follow the logic of feelings and emotions and seldom the outcome of balanced conclusions premised upon evidence (Oppenheim, 1992).

Understanding attitude formation and development is valuable as this study examines the superficial, perhaps less enduring and relatively changeable facets at opinion and attitude levels of the hierarchy on the vertical axis. Simultaneously, the horizontal axis of attitude formation is relied upon to some extent as Town and Community Council respondents were asked to reflect opinions of the public in their local community council area (Figure 7) therefore obtaining a mass of opinion data from all Town and Community Council areas to collectively represent the opinion of Powys as a whole. This study represents a point in time perspective of attitude to address the aim.

4.3. Research Methods

4.3.1. Questionnaire Construction and Distribution

*Questionnaire construction* involved several tests (pilots) from October to December 2013 trying and testing contents, making changes in response to feedback to ensure it is answerable, and addresses the aim and research questions (1.2). With the aim in mind, objectives were established to understand the purpose of each question in the questionnaire which resulted in a draft comprising 14 questions. In Newtown, Powys 1
questionnaire was tested on 3 individuals selected at random and were agreeable to completing it and providing feedback. Feedback obtained was acted upon to improve the questionnaire before again testing the questionnaire. Each test was conducted in different locations in Powys, including Llandrindod Wells and Brecon on 3 new respondents to ensure no previous familiarity with questions. Given the questionnaires were sent to Town and Community Councils for unsupervised completion, pilot questionnaires were also conducted in this manner. A questionnaire was given to a random but willing respondent for completion and returned by email.

Excellent suggestions were received for improvements including shorter and more concise wording, providing a short explanation under each question, and ‘putting the questions on their doorstep’ meaning respondents may not have interest in sustainable development, but is interested in wind turbines causing visual impact therefore, questions needed a relation to the respondent to provoke responses. Feedback aided in selecting onshore wind turbines as the development type currently appearing to test the local-global relationship in Powys, simultaneously the public were likely to have an opinion on this development type thus ‘putting questions on respondents’ doorstep’.

Specifically referring to research question C as a proof of concept, selecting variables or ‘indicators’ of sustainable development was problematic as respondent feedback to draft questionnaires demonstrated various interpretations of sustainable development from their children being able to buy houses, maintaining local food production, to subsidised bus rides for pensioners. In response, the questionnaire contained categories taken from the EC (2011) SDS: Monitoring Report (Table 1). Thus, the questionnaire developed a method that where scale of onshore wind turbine development was no longer ‘acceptable’, how concerned would respondents be for the 6 areas in table 1.

### Table 1. Areas of Concern/Interest within European Union sustainable development.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>Theme 1-Socioeconomic development</td>
</tr>
<tr>
<td>Education</td>
<td>Theme 3-Social Inclusion</td>
</tr>
<tr>
<td>Population</td>
<td>Theme 4-Demographic changes</td>
</tr>
<tr>
<td>Human Health</td>
<td>Theme 5-Public Health</td>
</tr>
<tr>
<td>Climate Change</td>
<td>Theme 6-Climate Change and Energy</td>
</tr>
<tr>
<td>Transport and Mobility</td>
<td>Theme 7-Sustainable Transport</td>
</tr>
</tbody>
</table>

Regarding question C (1.2), selected variables’ were social and economic in character as these were considered more readily and easily visible to respondents, thus considered more sensitive to identifying whether the phenomenon between acting local whilst thinking global exists. Variables fall within a theme of sustainable development as outlined in the EC (2011) SDS: Monitoring Report. It was deliberate that none of the selected variables’ specifically fall within the environmental facet of sustainable development. Environmental protection is dealt with by European law and policy, examples includes European Union directives, 2011/92/EU (Environmental Impact Assessment), and 92/43/EEC (Habitats Regulations Assessment) to name two. Additionally under UK Planning Acts (as apply to Wales), the environment is well recognised as a ‘material consideration’ and can be reason for refusal (see, Planning Inspectorate, 2014).
Feedback from questionnaire testing was included within the final questionnaire (Appendix A) which was sent to Town and Community Councils for unsupervised completion and asked as few questions as possible obtaining sufficient information to address the aim (1.2). Table 2 contains brief details of the main concepts investigated.

**Table 2. Principle concepts investigated in the questionnaire.**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Questionnaire Questions’</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td></td>
<td>Details, research purpose and instructions on questionnaire completion and return.</td>
</tr>
<tr>
<td>Information for Comparison</td>
<td>Preliminary</td>
<td>Town and Community identification, age, gender and size. Any renewable energy and/or wind turbine industry affiliation providing an understanding of bias.</td>
</tr>
<tr>
<td>General Attitude</td>
<td>1 – 9.</td>
<td>Gauging opinion toward renewable energy, wind turbines and sustainable development</td>
</tr>
<tr>
<td>Scale of Development</td>
<td>10 – 15</td>
<td>Level of acceptance: Assessed wind turbine height, number and distance considered acceptable. Areas of concern: assessed whether concern above acceptable height and number but below acceptable distance falls within sustainable development indicators (Table 1).</td>
</tr>
<tr>
<td>Planning balance</td>
<td>16 – 18</td>
<td>Planning balance: whether a spatial distribution is considered to contribute to sustainable development. Also, opinion toward ‘planning balance’ when considering a planning application toward sustainability.</td>
</tr>
<tr>
<td>Further opinion</td>
<td>19</td>
<td>Sustainable development opinions and previous questionnaire questions.</td>
</tr>
</tbody>
</table>

Likert scales were applied to maximise the questionnaire by converting categorised responses into quantitative data. Likert scales were created using equal interval measures with upper and lower anchoring points (Oppenheim, 1992). Equal interval means ‘the size of the interval between two adjacent points is the same as that between any other two adjacent points’ (Howitt and Cramer, 2000, 50) with 1 being the unit interval for all questionnaire likert scales.

To capture the geographic resolution of Powys, questionnaires were distributed to all 110 Town and Community councils using a systematic sample. The sampling method confined respondents’ to answer questions on their local Town or Community Council areas to capture the diversity of opinion across Powys. Given Powys is 5190km² (Powysi, 2013(c)) a random sample of individual respondents would not have captured enough people, neither sufficient diversity of respondents within the time permitted. Town and Community Councillors represent people in their respective areas therefore, considered an estimate of local public opinion. Given only 110 respondents were approached there was always a risk too few would respond to provide enough information to produce meaningful or significant results.

A response rate of 13.6% with 15 questionnaire responses received with all important questions necessary for the results, although 7 non-responses to questions 18 and 19 (appendix A). One respondent did not answer questions needed for research question B (5.3) or proof of concept regressions’ (6.3) meaning 5.3 and 5.4.1 were conducted based on 14 responses.
The low response rate potentially presents a problem where non-responses can lead to bias insofar as those with strong positive or negative opinions may be more likely to answer the questionnaire. The following is not a drop-out or non-response analysis as no information was available about non-respondents. Town and Community Council respondents represent an estimate of public opinion therefore, Table 3 compares Powys County census data with data derived from questionnaire responses simply to get an idea of whether the sample is representative of Powys. Table 3 suggests the sample is probably not representative of the Powys population only making 2 statistical comparisons regarding age and gender.

**Table 3.** Sample Characteristics compared with 2011 Powys Census Data

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample Responses(^a)</th>
<th>Powys Census Data(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (median)</td>
<td>60.5</td>
<td>46</td>
</tr>
<tr>
<td>(^c)Gender(Men:Women)</td>
<td>68:32</td>
<td>49:51</td>
</tr>
</tbody>
</table>

\(^a\)Number of respondents: 15  
\(^b\)Powys (2013a)  
\(^c\)Ratio of men to women

Table 3 requires cautious interpretation as age gaps are expected because incumbent members of Town and Community Councils tend to be older and experienced individuals which is a likely result had all 110 Town and Community Councils responded. Erring on caution, it cannot be justified based on table 3 that 15 Town and Community Council responses are representative of the entire Powys population. Therefore, results only represent the sample, and cannot be generalised to the Powys population.

Additionally, 14 Town and Community Councils responded saying agreement and consensus to questionnaire questions could not be achieved to represent their community, making 29 responses (26%) the total response rate. Anonymity and confidentiality was promised respondents therefore, individual responses are not included nor mapped.

### 4.3.2. Rationale

Questionnaire rationale was based on finding enough data to draw conclusions to research questions A and B toward answering the aim. Preliminary questions were asked (Table 2) to derive information to compare and evaluate whether any potential bias or skewness in the responses was present. Early questionnaire sections (questions 1-9, Appendix A) was obtained to address research question A focusing upon renewable energy and wind turbines ascertaining local public opinion on the role these items play toward local sustainable development before evaluating attitude toward local development for a global community. To address research question B, questions 10-15 (Appendix A) were asked to derive response frequency toward an acceptable turbine scale regarding height, number and distance.

To inform question C only as a concept, questions 10-15 (Appendix A) were also asked to create ‘unacceptable’ turbine scales which assumed taller wind turbine height becomes unacceptable (where it is above mean acceptable turbine height), greater numbers of turbines becomes unacceptable (where it is above mean acceptable turbine number), and shorter distances from houses and schools becomes unacceptable (where it is below...
mean acceptable turbine distance) (see, 6.3.1). Rationale for regression models lies in a model assumption; there is a linear relationship between each $X$ variable with the $Y$ variable. Applying a linear model appears appropriate as it would follow logic that where scale of wind turbine development is considered broadly acceptable to the local public there are unlikely to be areas of concern. Where there is local public concern, it stands to reason the scale of turbine development has become ‘unacceptable’ with the assumption that the greater the local public concern, the greater the unacceptable turbine scale. The multiple regressions make this assumption in a linear way to relate a unit increase of local public concern (denoted areas of interest, Table 1) to explain (minimum) unacceptable scale of wind turbine development (Table 5). Power of the models’ is comparing independent variables’ to understand importance of one area of interest compared to another (Table 6) when pursuing sustainable development under the EC (2011) SDS: Monitoring Report.

4.3.3. Data Analysis and Presentation

Data analysis begins with presenting descriptive statistics to understand the propensity of respondents to answer in a particular manner (4.1) followed by the first step of the results addressing research question A, whether there is broadly a positive or negative attitude toward acting local when thinking global regarding renewable energy and wind turbines when working toward sustainability (see 5.2). The final step addresses research question B, using onshore wind turbines, is there a scale of acceptable turbine development (see 5.3). Results addressing both research questions A and B are brought together to make broad statements (conceptual leverage) in the conclusion regarding the attitude and opinion toward acting local whilst thinking global (phenomenon).

4.3.4. Question C: Proof of Concept

Responses used to address question C outputs are not results because regression models’ did not produce any statistically significant result (Table 5; 6.3.1). Subsequently, methods to address question C are simply presented and described.

The first part of research question C, where wind turbine scale is considered unacceptable, do areas of concern which fall within Sustainable Development as prescribed by European Commission (2011) SDS: Monitoring Report explain minimum unacceptable turbine scale, was analysed using 3 linear multiple regression models, 1 for height, 1 for number and 1 for distance. Areas of interest (Table 1) were regressed with unacceptable wind turbine height producing regression 1 (Table 5), unacceptable turbine number producing regression 2, and unacceptable turbine distance producing regression 3. Output parameters from each linear multiple regression model can be explained using the following,

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \epsilon \]

A linear regression model was selected as it can accept or reject a null hypothesis which in this study appears,

\[ H_0 – \text{there are no significant concern for areas of interest where scale of wind turbine development is unacceptable.} \]
Rejection of the above statement means unacceptable wind turbine scale causes respondent concern in at least one or more areas of interest. Regression models show where there is statistically significant concern \((p<.05)\), a unit increase in concern can be related to a measurable amount of unacceptable scale of wind turbine development using beta values. Simultaneously to a confidence level of 95% \((p<.05)\), meaning a 5% chance results were derived by random chance. Models’ produce a total extent unacceptable height, number or distance can be explained by independent variables included in the models’ (education and population etc) on a unit by unit basis. The tool enables,

1) simultaneous modelling of numerous variables,
2) readers ‘see’ the effect of each \(X\) variable on the \(Y\) variable enabling inferences (beta coefficients)
3) tests the significance of each \(X\) variable on the \(Y\) variable, accepting or rejecting a null hypothesis that ‘there is no linear effect of \(X\) on \(Y\) holding other \(X\) variables constant.

No variable was statistically significant meaning there is more than 5% chance the regression output was produced by random chance. In other words, we cannot be 95% confident of trusting the model output hence, are not results.

Model checks for validation and reliability were limited as the regressions’ produced no statistically significant outputs (Table 5). Nevertheless, the model relies on assumptions (below) which can be checked to understand whether there are errors and the extent those errors are influencing the model.

1) Linear relation exists between \(X\) variables with \(Y\) variable.
2) Errors have mean 0 with constant variance for all \(X\) value combinations (homoscedacity).
3) Residuals are independent; value of one error is not affected by the value of another error (autocorrelation).
4) For each \(X\) value, errors have a normal distribution about the regression line.
5) No significant correlations exist between \(X\) variables (multicollinearity) (adapted from Rogerson, 2001).

To ascertain whether likert scales reliably measure what they are designed to, Cronbach alpha could be applied to statically test internal consistency of each factor in the regression models’. Cronbach alpha statistically estimates reliability testing ‘factors’ to show internal consistency with higher coefficients (closer to 1) statistically estimating items within a factor are similar (correlated) although simultaneously contribute sufficiently unique information (Streiner, 2003). The factors for a Cronbach reliability test would be unacceptable wind turbine scales (\(Y\) variables) and areas of concern (\(X\) variables).

The second part of question C is that if there were areas of concern, which \textit{areas are of greater local public importance when working toward sustainability}. This was analysed by ranking beta values by greatest number whether positive or negative evaluating which facet is held with greatest importance across all three regressions (Table 6, see 6.3.2).

In summary, the first part of question C, \textit{where wind turbine scale is considered unacceptable, do areas of concern which fall within Sustainable Development as prescribed by European Commission (2011) SDS: Monitoring Report explain minimum unacceptable turbine scale}, was analysed presenting the three multiple regression models (Table 5), one each for turbine height, number and distance using 6 selected variables (Table 1) to explain unacceptable scales of turbine development (see, 6.3.1). Additional to
regressions’ was that if there were statistically significant areas of concern, *which areas are of greater local public importance when working toward sustainability*. This was analysed by ranking beta values by greatest number whether positive or negative evaluating which facet is held with greatest importance across all three regressions (Table 6; see 6.3.2).

4.4. Research Ethics
In contact with respondents which, to various degrees included emails, phone calls and letters there was no attempt to lure particular questionnaire responses. Neutral questionnaire wording was selected based on pilot feedback.

External influences at the time this study was carried out include policy influences including Planning Policy Wales (Welsh Government, 2014) which adopts a favourable position on renewable energy technologies by virtue of TAN8. Also, pressure on certain locations within Powys to accept wind turbine development by delineation of Strategic Search Areas prescribed in TAN8 (Welsh Assembly Government, 2005). Additionally, the current public inquiry proceedings (Banksolutions, 2014) in the context of the existing 148 wind turbine applications permitted from 2010 to 2014 across Powys. These may have played a role in respondent opinions and attitudes.

4.5. Research Limitations
There are limitations to this study. A representative sample of the Powys population could not be reached, thus all 110 Town and Community Councils were asked to represent public opinion and attitude in their area. Therefore, this study is a point in time estimate of public attitude within the 15 Town and Community Council sample. Results are not representative of the Powys population (Table 3). Sample responses merely provide an insight used to address the aim.

The questionnaire was not exhaustive in drawing opinions and attitudes toward all areas of sustainable development. Responses provided sufficient information to address research questions A, B and test C. At Town and Community Council scales, there are likely other themes besides renewable energy and wind turbines considered important to a particular locality toward sustainability, an example being tourism and its contribution to the local economy. However given this study investigates whether there is a tension between acting local whilst thinking global, this study focused only on wind turbines.

Research question C is not a result. It was an experimental idea which was tested but failed to be significant, therefore simply presented and reviewed within the discussion, and regard the experience of conducting the survey part of training in planning and development within the discipline of Geography.
CHAPTER 5–RESULTS

‘Be the change you want to see in the world’

Mahatma Ghandi, (unknown)

Descriptive statistics provide understanding of sample characteristics (5.1) before presenting results divided into 2 steps addressing research questions’ A (5.2) and B (5.3). Output information informing question C is presented and described in section 6.3. It shows what could be done with better data derived from questionnaires in this way.

5.1. Descriptive Statistics

The questionnaire asked 6 questions to reveal insight into whether there was a predisposition to respond in a certain way, potentially revealing bias. Interestingly, 3 respondents had at least 1 member gaining financially from wind turbines on their land and those respondents also showed that at least one member (not necessarily the same one) could see an existing or proposed wind turbine site. Overall 8 of the 15 respondents had at least one member who could see an existing or proposed wind turbine site (Table 4).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Coding(Likert scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elected MALE members?</td>
<td>5.73</td>
<td>2.79</td>
<td>Number(continuous variable)</td>
</tr>
<tr>
<td>Elected FEMALE members?</td>
<td>2.73</td>
<td>1.39</td>
<td>Number(continuous variable)</td>
</tr>
<tr>
<td>Elected members total?</td>
<td>8.47</td>
<td>2.85</td>
<td>Number(continuous variable)</td>
</tr>
<tr>
<td>Oldest elected member?</td>
<td>74.47</td>
<td>8.10</td>
<td>Number(continuous variable)</td>
</tr>
<tr>
<td>Youngest elected member?</td>
<td>39.27</td>
<td>8.78</td>
<td>Number(continuous variable)</td>
</tr>
<tr>
<td>Town and Community Council member work for or install renewable energy technologies?</td>
<td>0.53</td>
<td>0.52</td>
<td>0(No);1(Yes)</td>
</tr>
<tr>
<td>Town and Community Council member see existing or proposed turbine site from house?</td>
<td>0</td>
<td>0</td>
<td>0(No);1(Yes)</td>
</tr>
<tr>
<td>Town and Community Council member financially gain from 1 or more WT's on land?</td>
<td>0.20</td>
<td>0.41</td>
<td>0(No);1(Yes)</td>
</tr>
<tr>
<td>Town and Community Council member financially gain from 1 or more WT's in another way?</td>
<td>0.20</td>
<td>0.41</td>
<td>0(No);1(Yes)</td>
</tr>
<tr>
<td>Town and Community Council currently RECEIVE money from WT development?</td>
<td>0.20</td>
<td>0.41</td>
<td>0(No);1(Yes)</td>
</tr>
<tr>
<td>Town and Community Council currently OFFERED money for WT development or company?</td>
<td>0.40</td>
<td>0.51</td>
<td>0(No);1(Yes)</td>
</tr>
</tbody>
</table>

Questions giving insight into potential bias

\[ n=15 \]
Interestingly, 3 Town and Community Councils were receiving monetary payment for wind turbines, with 6 responding they have been offered money by a wind turbine company or developer. This perhaps suggests increased awareness of wind turbines by particular Town and Community Councils which may give rise to stronger positive or negative views.

5.2. Question A: Public attitude toward acting local when thinking global

Results showed the vast majority of respondents were ‘Definitely concerned’ (2) or ‘Concerned’ (10) about achieving sustainable development within the WCED (1987) definition (Figure 9), only 1 responding ‘definitely not concerned’. Additionally, 12 of the 15 respondents responded people are at least partly responsible for climate change (Figure 10) also suggesting respondents recognise climate change occurring in the first instance. However, the 12 respondents at least concerned for sustainable development were not always the same 12 who responded that people were partly responsible for climate change.

**Figure 9.** Bar graph showing relative proportion of concern toward achieving sustainable development between respondents.

The vast majority of respondents recognise renewable energy as part of sustainable development, and energy derived from renewable technologies is a good method of energy production (Figure 10). However across the sample, respondents appear uncertain whether current land use is sustainable demonstrated by 7 responding no, 6 responding yes, and 2 responding they do not know.
Figure 10. Response frequency column to selected ‘General Attitude’ questions (Table 2).

A pattern of uncertainty was present when questioned whether wind turbines present a good method of energy production with 4 positive, 5 neutral and 6 negative responses and, whether wind turbines are part of sustainable development with 7 positive, 2 neutral and 6 negative responses (Figure 10).

Regarding planning process toward sustainability, results show the majority of respondents (9) favoured an equal balance of social, economic and environmental with one never taking priority over another (Figure 11). Whereas 3 respondents favoured social and environmental facets when determining a planning application suggesting either a satisfactory level of economic development sufficient to enable respondents to think more about social and environmental facets or suggesting economic factors are given enough importance in the decision-making process anyway. The questionnaire did not derive enough information to address reasons for given responses.
Given respondents broadly recognise renewable energy and wind turbines as part of sustainable development (Figure 10), the question then asked was whether respondents would be willing to accept ‘unfavourable’ development in their local community for a global benefit; would they be prepared to act local whilst thinking global. Only 2 respondents were positive to accepting locally unfavourable development with the vast majority unwilling (9), with 4 respondents adopting a neutral position (Figure 12).

**Figure 11.** Pie chart showing relative importance of sustainable development facets when determining a planning application.

**Figure 12.** Bar graph showing extent respondents would be willing to act local when thinking global.
Question 9 wording (appendix A) to derive figure 12 may have been framed incorrectly as preceding questions asked opinion toward a construct such as wind turbines. However, question 9 asked whether respondents would be willing to accept ‘unfavourable’ development of any type. Given previous questions related to renewable energy and wind turbines, question 9 may have had negative connotations perhaps inferring all renewable energies would be unfavourable to local communities. Nonetheless, inclusion of ‘unfavourable’ was considered necessary as this presents a ‘worst case scenario’ that if there was negative feeling toward a given type of development, would the community as a whole still be willing to accept some development for a global community. Figure 12 shows the answer across the sample is no.

5.3. Question B: Wind turbines–Scales’ of Acceptability

Of all 15 respondents, only 14 respondents provided information for the following results. Onshore wind turbines were considered indicative of a tension between acting local whilst thinking global with results indicating a scale of acceptance for wind turbines in the sample although with large ranges from the mean (Figures’ 13, 14 and 15). Sample mean acceptable wind turbine height was 45m with 30m standard deviation (Figure 13). Almost 50% of respondents noted either 45m or 60m as an acceptable height with 2 responding 90m.

![Figure 13](image_url)  
**Figure 13.** Response frequency bar graph displaying acceptable wind turbine height

Figure 14 shows a mean of 10 turbines. Standard deviation was 10 turbines with 10 and 15 turbines selected most frequently. Also, 4 respondents selected 0 turbines as acceptable for their community area despite selecting an acceptable height in the previous
questionnaire question. This perhaps indicates a preference toward no turbines in the first instance although, if faced with a wind turbine planning application in their community area, respondents may be prepared to tolerate (not necessarily support) a given height of wind turbine.

![Bar graph showing acceptable wind turbine number](image)

**Figure 14.** Response frequency bar graph displaying acceptable wind turbine number.

Regarding turbine distance from houses and schools, greatest response frequency was for 1000m or more (Figure 15) accounting for 12 of the 14 respondents. Mean acceptable turbine distance was 1300m, with 600m standard deviation.
Sample results show mean acceptable wind turbine height of 45m, mean acceptable number of 10, and 1300m mean acceptable distance from a wind turbine. Results contain weaknesses due to relatively high standard deviations in all three measures of acceptable turbine scale. Equally turbine height, number and distance have been questioned independently whereas, in practise this is not the case and acceptance levels are likely different when faced with a planning application combining the results 45m x 10 turbines approximately 1300m from homes and schools on a particular site.

5.4. Question C: Proof of Concept–Unacceptability and Concerns
As stated above, the method to address question C was experimental and tested in this study although failed to produce a result giving no significant variables in the multiple regressions’ (Table 5). Consequently, it is not presented as a result. Instead, the ideas and outcomes are simply presented, and the idea of how question C was thought to be addressed is explained within section 6.3.
CHAPTER 6–DISCUSSION

‘Is ours a finite world? A fair defence can be put forward for the view that the world is infinite; or that we do not know that it is not. But, in terms of the practical problems that we must face in the next few generations with the foreseeable technology, it is clear that we will greatly increase human misery if we do not, during the immediate future, assume that the world available to the terrestrial human population is finite. "Space" is no escape’

Garret Hardin (1968)

6.1. Question A: Public attitude toward acting local when thinking global

Results indicate tension between acting local when thinking global across the sample. Respondents recognised renewable energy and wind turbines as part of sustainability (Figure 10), going further showing the majority are concerned with achieving sustainable development (Figure 9) and uncertain whether current land use is sustainable (Figure 10). Nevertheless, this does not translate into being prepared to act locally (Figure 12). Results are weakened given the low response rate, and generalising results to the Powys population is unjustified as the sample is not considered representative (Table 3). Nonetheless, it is reasonable to consider the conceptual relevance of sample results which suggest there may be reasons for an unwillingness to act locally.

Results here appear harmonious with other results of a ‘social gap’ perhaps indicative of the tension between acting local when thinking global regarding wind turbines. In a Michigan USA study, Bidwell (2013) found a social gap between underlying values regarding wind energy development, between ‘altruistic’ values which increased support for turbine development, and ‘traditionalist’ values which reduced wind turbine support. Academics generally advocate more responsive local level participation usefully separated into 2 broad but related areas, political and social distance (Pepermans and Loots, 2013). Academics have argued too much political and social distance between decision-makers and developers from public citizens. Distance in this context refers to an ‘affective alienation between groups in society. Political distance refers to local communities and decision-makers’ (Pepermans and Loots, 2013, 323). Social distance is local communities from developers of economic activities (ibid, 2013).

Academics assert reducing political distance involves responsive local participation, enabling decision-makers and developers to consider points of support and concern facilitating trust and allowing creative solutions toward a mutually acceptable project (Pepermans and Loots, 2013). This position is summarised as, ‘participation must foster the acceptability rather than the acceptance of decisions’ (ibid, 2013, 326) which becomes important when asking locals to act locally toward sustainability.

In planning, political distances appear to arise as public consultation on a planning application typically allows 21 days consultation (section 21, Town and Country Planning (Development Management Procedure) (Wales) Order, 2012), providing citizens a choice between approval or rejection of a fixed plan, making time for interactive solutions between developers and the public impossible (Pepermans and Loots, 2013). Post-consultation, opinions of public support and concern are often not addressed by the decision-maker or developer specifically, rather the decision-maker takes public responses into account when making the final decision which may contribute to feelings of ‘distance’ amongst citizens who hold their views with stronger importance and feel they should be addressed.
Furthermore, when the planning process has started with submitting an application to the planning authority to develop a site, decision-making authorities typically take account of legal restrictions regarding spatial planning, hindrance issues and safety issues as prescribed within relevant law and policy. Consequently, during consultation the scope of the debate and concerns the public are ‘allowed’ is narrowed to what are considered ‘material considerations’ when determining a planning application (see, 3.3). Limiting the scope of debate can increase feelings of procedural injustice thus increase political distance (Pepermans and Loots, 2013). Education for example as an area of concern to some citizens, which was almost significant in this study (Table 5) may well be a consideration to the application although not ‘material’ as judged by the decision-maker looking within relevant law or policies to what is a material consideration. Therefore, the decision-maker has no obligation to consider education specifically.

Given an unwillingness to accept local development for a global benefit (Figure 12), in the literature denoted local risks/costs for global benefit (Hall et al, 2013), it is perhaps necessary to widen what can be ‘materially considered’ within a planning application likely involving qualitatively improved participation. This appears problematic as responsive involvement takes time and section 22, Town and Country Planning (Development Management Procedure) (Wales) Order (2012) makes it a duty for Welsh planning authorities to determine planning applications in 8 weeks. The present planning process appears to increase political distances between authorities from local citizens by limiting material considerations ‘allowed’, and the time constraint arguably disabling potential solutions where publically unacceptable development could be resolved through local public involvement to become acceptable development. The present planning process as abovementioned utilises ‘consultation’ which, prima facie appears somewhat incompatible with a sustainable development process toward sustainability.

Nonetheless, it is unlikely all disagreements between stakeholders can be overcome by providing more information or giving people an extra say (Barry and Ellis, 2011) especially as local attitudes and behaviours are rooted in values and emotions, which are difficult to change (ibid, 2011) suggesting a need for altering the Welsh planning system. Barry and Ellis (2011) have proposed to reduce political distance by empowering affected communities to choose between alternatives, including the right to veto development through an open and fair process. They propose a regulatory system enabling participation and democratic debate, which includes a top-down (national or international) low carbon energy strategy which undergoes public consultation. Within that strategy, communities (demarcated spatially or otherwise) know they must achieve carbon reduction targets within a timeframe allowing a bottom-up degree of flexibility about how to achieve these targets when working toward sustainability.

Pepermans and Loots (2013) suggest participation needs reconsideration by reducing social distance. Placing onus upon developers to improve participation appears problematic given the context developers operate. Turbine developers’ appear faced with two problems of increasing competition and decreasing number of appropriate turbine sites generating a rush of planning applications for permission on available sites (ibid, 2013). This places developers at an immediate loss for time as the system compels the developer to start engaging local communities after the project is fixed, or risk losing the site to a competitor. Site location and security thus begins the process of top-down planning prioritised above public involvement creating a model of ‘develop, announce and defend’ acting as a ‘trigger for opposition than an incentive for the proper design of acceptable projects’ (Wolsink, 2007, 1205). Typically all developers approach land in this
way generating numerous proposals, which often ignore each other’s proposals thus, can increase uncertainty and mistrust amongst local communities (Pepermans and Loots, 2013).

Consequently, developers arguably fall into a socially distant position because of market pressures. Reduced social distance has been linked to successes of turbine development with Toke et al (2008) in Pepermans and Loots (2013) indicating social acceptance of wind turbines is higher when the turbine developer is locally embedded. Association to the ‘local’ has been developed further noting, ‘success of wind power depends on how well the wind industry learns to include the public in decisions, both for the opportunities allowing broader dissemination of information about wind power and for suggestions the public can contribute to the discussion of their concerns and how to accommodate them’ (Pasqualetti, 2002 in: Wolsink, 2007, 1204).

Results here suggest renewable energy and wind turbines are part of sustainable development, developers cannot reasonably be expected to prioritise public opinions over economic viability and security of sites. Consequently, the planning system appears to require improvement toward shortening political distances before developers can shorten their social distances. Wolsink (2007) suggests bad communication can always lead to problems, and is mostly caused by the way decision-making is framed, by limiting options for public participation to only consultation after design and announcement of a proposal. It appears decreasing political and social distances requires collaborative planning with an involved public which itself needs rethinking both in terms of approach toward involvement, also time and resources to empower the local public to meaningfully consider their options prior to accepting or rejecting a proposal when acting toward local sustainability.

6.2. Question B: Wind turbines—Scales’ of Acceptability
In this study, mean acceptable wind turbine height, number and distance were 45m, 10 turbines and 1300m, respectively (5.3). Literature reporting numeric thresholds of publically acceptable turbine scales appears presently under-researched. However literature notes broad findings (see, 2.4.1) not useful for precise comparison, but usefully compared with results in this study.

Acceptable turbine height was questioned (question 10, appendix A) independent from number (question 12) and distance (question 14) which limits comparability with studies that have not done the same. However, both Meyerhoff et al (2010) comparing two regions in Germany, and Ek (2006) cited in Meyerhoff et al (2010) in a national study of Sweden find turbine height does not have a significant influence on landscape impacts, in contrast to the expectation that people prefer smaller turbines because of smaller impacts. Meyerhoff et al (2010) show maximum turbine height was the least important attribute for respondents’ choices on landscape impacts, which may have been for several reasons but one asserted was perhaps respondents do not care much about turbine height provided they are sited far away from residential areas. Interestingly, perceived landscape impact is held as a main motivator of acceptable turbine development due to the potential for visual impact (Wolsink, 2007) thus, interesting to observe priority given to turbine height by respondents in other studies. Respondents’ in this study were asked directly to select an acceptable height, number and distance but not given opportunity to prioritise in order of importance thus, not comparable.

Acceptable turbine number was asked from one viewpoint over the landscape with the mean result of 10 turbines. At least one study has identified a turbine number considered
acceptable. In the UK Lee et al, (1989) in Devine-Wright (2005) found greatest support for less than 8 turbines within a ‘wind farm’. In this study, ‘wind farm’ was omitted as it suggests a concentrated distribution in the number of turbines within a landscape.

Asking respondents to decide an acceptable number within a landscape has problems. One problem commonly found is the experience/familiarity of respondents with wind turbines, which this study’s questionnaire did not draw information. Ladenburg and Dahlgaard (2012) in a Danish sample of 1086 respondents demonstrate the number of turbines respondents see on an average day has a negative effect on attitude. Their results suggest seeing more than five turbines daily had a negative influence on attitude with negative attitudes not changing in response to seeing more than five turbines daily. Turbine experience was studied further in Ladenburg et al (2013) studying 1100 respondents in Denmark showing the number of turbines matters, the more turbines respondents have in the local area, the more negative they are towards more onshore turbines. However for this relation to apply, if the respondent had a view to an onshore turbine from their residence, respondent attitudes were significantly influenced by the number of turbines in the local area. Their results also showed if respondents did not have a view to a turbine from their residence, there was no relationship between negative attitudes and number of turbines in the local area.

Mean acceptable turbine distance across the sample was 1300m from homes and schools which agrees with inconsistent findings in the literature (2.4.1). Studies report various outcomes. Swofford and Slattery (2010) cited in Ladenburg et al (2013) suggest turbine acceptability increases with increasing distance from residential areas. Meyerhoff et al (2010) found similar results when comparing two regions of Germany noting, ‘on average, people in Westsachsen and Nordhessen prefer to move turbines further away from residential areas’ (91). Other studies disagree, showing turbine acceptability decreases with increasing distance from residential areas (Warren et al (2005) in Ladenburg and Dahlgaard (2012). Equally Johansson and Laike (2007) in Ladenburg et al (2013) found distance did not influence attitude significantly. Abovementioned results suggest living close to wind turbines can influence attitude differently. Irrespective of whether a study is conducted before or after a specific wind turbine project, literature is inconsistent in indicating the role distance plays when informing attitudes. Results in this study do not offer clarity on whether residents closer to turbines are more or less favourable.

As questions were independent regarding acceptable wind turbine scales (questions’ 10, 12 and 14, appendix A) in Powys, there are caveats to practically using the information. Respondents providing data to derive results were from different areas of Powys. Thus, it is incorrect to combine results here and apply them to a site in Powys. Variability will arise in terms of community and site context regarding how many (if any) turbines are considered acceptable, an example being that a site may well be 1300m away but located on a higher altitude hill which may be considered ‘overbearing’ to a village settlement. Mean results are the average across the sample. The method potentially presents a starting point for a developer to responsively involve local communities and begin a conversation when working toward sustainability, shortening social distance.

6.3. Question C: Proof of Concept—Unacceptability and Concerns
This research question was envisaged to provide information on the limits to acceptable wind turbine scales, additionally provide information on reasons for those limits (areas of interest). Presented here is simply a demonstration and explanation of how the idea was thought to function.
6.3.1. Unacceptability and Concerns

To demonstrate the idea behind addressing the first part of research question C, acceptable wind turbine scales were used to create ‘minimum unacceptable’ wind turbine scales with means of 45.1m for height, 11 turbines, and 1299.9m distance. This assumes ‘unacceptable’ development is higher than 45m acceptable mean height from figure 13, an increased turbine number than was said to be acceptable from figure 14, and a shorter distance from houses and schools than was said to be acceptable from figure 15. These then become ‘minimum unacceptable’ wind turbine scales’ of height, number and distance which were regressed with areas of concern (Table 1) denoted ‘independent variables’ (Table 5).

Table 5. Multiple regression models examining concerns explaining minimum unacceptable wind turbine scales‘.

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Independent Variables</th>
<th>β</th>
<th>Std Error</th>
<th>T</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression 1</td>
<td>Minimum unacceptable Wind Turbine Height(m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>4.39</td>
<td>2.92</td>
<td>1.50</td>
<td>0.18</td>
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</tr>
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<td>Education</td>
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<td>4.70</td>
<td>-1.63</td>
<td>0.15</td>
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</tr>
<tr>
<td>Population</td>
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<td>4.59</td>
<td>0.51</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Human Health</td>
<td>-6.93</td>
<td>8.23</td>
<td>-0.84</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>Climate change</td>
<td>-0.90</td>
<td>4.94</td>
<td>-0.18</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>Transport and mobility</td>
<td>2.20</td>
<td>4.84</td>
<td>0.45</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td>(Constant)β</td>
<td>68.79*** (st error=16.90), $R^2=0.75$, F=3.57 ($p&gt;0.05$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regression 2</td>
<td>Minimum unacceptable Wind Turbine Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>0.25</td>
<td>1.05</td>
<td>0.24</td>
<td>0.82</td>
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</tr>
<tr>
<td>Education</td>
<td>0.50</td>
<td>1.88</td>
<td>0.26</td>
<td>0.80</td>
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<tr>
<td>Population</td>
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<td>2.38</td>
<td>-0.05</td>
<td>0.96</td>
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<tr>
<td>Human Health</td>
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<td>3.30</td>
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<td>0.67</td>
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<tr>
<td>Climate change</td>
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<td>1.74</td>
<td>-1.27</td>
<td>0.24</td>
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</tr>
<tr>
<td>Transport and mobility</td>
<td>-3.11</td>
<td>2.23</td>
<td>-1.39</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>(Constant)β</td>
<td>25.77*** (st error=6.24), $R^2=0.73$, F=3.17 ($p&gt;0.05$)</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Regression 3</td>
<td>Minimum unacceptable Wind Turbine Distance(m)</td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>Employment</td>
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<td>117.66</td>
<td>-0.08</td>
<td>0.94</td>
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<td>Education</td>
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<td>228.81</td>
<td>0.88</td>
<td>0.41</td>
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<tr>
<td>Population</td>
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<td>328.45</td>
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<td>Human Health</td>
<td>237.55</td>
<td>289.28</td>
<td>0.82</td>
<td>0.44</td>
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<tr>
<td>Climate change</td>
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<td>133.85</td>
<td>-1.02</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Transport and mobility</td>
<td>149.00</td>
<td>237.02</td>
<td>0.63</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>(Constant)β</td>
<td>124.64 (st error=1317.54), $R^2=0.20$, F=0.29 ($p&gt;0.05$)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note: Regressions are linear with each dependent variable treated as continuous.
N=14 responses included in the regression
β=unstandardised beta co-efficients in metres for regressions’ 1 and 3, and number of turbines for regression 2.
*p<0.10
**p<0.05
***p<0.01
Independent variables were not significant in explaining minimum unacceptable scale of wind turbine development (Table 5). The following is a brief description of how one would have interpreted the regression outputs’ if they were statistically significant.

_Regression 1_ shows employment positively related to minimum unacceptable wind turbine height shown by the positive $\beta$ value of 4.39m (Table 5). In practise this would have meant greater concern for employment the higher the minimum unacceptable turbine height respondents would tend to select suggesting respondents may be willing to accept more height (higher heights of what becomes unacceptable). Whereas education appears negatively related to minimum unacceptable wind turbine height, -7.66m (Table 5) which would have meant where respondents have greater concern for education the lower minimum unacceptable turbine height they would be prepared to select (lower heights of what becomes unacceptable). Figures’ 16 and 17 show the linear relationships.

Figure 16. Relation between minimum unacceptable turbine height and employment concern
A unit increase of concern for education would have brought a tendency for respondents to select -7.66m lower height as the threshold for minimum unacceptable scale. In practice, given the sample mean acceptable wind turbine height of 45m is known (Figure 13), a unit increase from 0-1 in concern for education across the sample may bring that 45m threshold of acceptance down to 37.34m above that then becomes the 'minimum unacceptable' height. Conversely, a unit increase from 0-1 in concern for employment across the sample may have taken sample mean acceptable turbine height of 45m up to 49.39m, above that turbine height becomes minimum unacceptable turbine height.

6.3.2. Comparative Importance of each Concern

If there were significant areas of concern, the second part of question C, which areas are of greater local public importance when working toward sustainability, was thought to be addressed by ranking the beta values from the regression to understand the importance for each concern. Use of the regressions’ is not necessarily the significance of one variable over others, rather the importance respondents place on each area of concern compared to others appears of greater value when working toward sustainability. It was thought the regressions’ would show which variable is most important across respondents by being statistically significant. The lack of statistically significant concerns (Table 5) was likely due to low response rate, although can at least in part also be attributed to differing importance placed upon these 6 concerns by respondents not acting in the exact same way representing different areas of Powys. To some degree this suggests ‘the one size fits all’ idea of sustainability may indeed not be true as differing areas hold concerns with greater or lesser importance. Comparing variable importance compares value placed upon each area of concern which would have indicated the importance respondents hold such concerns (Table 6; Figure 18).
Figure 18. Graph comparing relative importance of concerns in explaining minimum unacceptable wind turbine distance.

Shown graphically and choosing a concern, the steeper the line (further away from the X axis) the greater the importance held by respondents (Figure 18). The steepest line is population which would have meant concern for population is held with greatest importance across all respondents relative to other concerns included in the regression when explaining minimum unacceptable wind turbine distance. Figure 18 has been ranked in order of importance (shallowest to steepest line) for distance along with height and number included in (Table 6) also demonstrating the direction whether positive or negative. If regressions’ were statistically significant, table 6 would simply show which area of concern is collectively held with most importance for sample respondents.

Table 6. Ranked regression β-values assessing concern importance.

<table>
<thead>
<tr>
<th>Area of Concern/Interest</th>
<th>Height Rank (direction)</th>
<th>Number Rank (direction)</th>
<th>Distance Rank (direction)</th>
<th>Totala</th>
<th>Tolerance Directionb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>4(+)</td>
<td>2(+)</td>
<td>1(-)</td>
<td>7</td>
<td>(+)7</td>
</tr>
<tr>
<td>Education</td>
<td>6(-)</td>
<td>3(+),</td>
<td>4(+)</td>
<td>13</td>
<td>(-)7</td>
</tr>
<tr>
<td>Population</td>
<td>3(+)</td>
<td>1(-)</td>
<td>6(-)</td>
<td>10</td>
<td>(+)8</td>
</tr>
<tr>
<td>Human Health</td>
<td>5(-)</td>
<td>4(+),</td>
<td>5(+),</td>
<td>14</td>
<td>(-)6</td>
</tr>
<tr>
<td>Climate change</td>
<td>1(-)</td>
<td>5(-)</td>
<td>2(-)</td>
<td>8</td>
<td>(-)4</td>
</tr>
<tr>
<td>Transport and mobility</td>
<td>2(+)</td>
<td>6(-)</td>
<td>3(+),</td>
<td>11</td>
<td>(-)7</td>
</tr>
</tbody>
</table>

Note: Importance ranking 1-6 conducted on β values from Table 5. Greatest number whether positive or negative was assigned 6 (greatest importance) continuing to 1 (least importance) assigned to the number closest to 0.

*aSum-total of all 3 models, greater the score equal to greater respondent importance.
Tolerance score indicating overall ‘area of concern’ direction across the three regressions’. Greater a positive score, the more tolerant respondents are toward a greater scale as minimum unacceptable turbine scale for a given area of concern. Conversely, the greater a negative score, the less tolerant respondents are to minimum unacceptable turbine scale, 0 being neutral. Respondent tolerance is summarised below.

- Number: + relationship means more turbines as minimum unacceptable (more tolerant)
- Number: - relationship means fewer turbines as minimum unacceptable (less tolerant)
- Height: + relationship means higher turbines as minimum unacceptable (more tolerant)
- Height: - relationship means shorter turbines as minimum unacceptable (less tolerant)
- Distance: + relationship means more distance as minimum unacceptable (less tolerant)
- Distance: - means selected closer distance as the minimum unacceptable (more tolerant).

Summing ranked importance for height, number and distance together with the directions' provides overall tolerance direction. More tolerant was positive for height and number, therefore negative distance scores became positive and positive distance scores became negative when summing total tolerance direction. Example for population is, 3+ -1 +6 = 8.

Not one variable was significant although if they had been then table 6 would have shown human health is held with most importance amongst respondents followed closely by concerns for education. These two concerns may have played an elevated role in explaining respondents’ selecting a minimum unacceptable wind turbine scale. When concerned for population, respondents perhaps had more tolerance toward greater scales becoming the minimum unacceptable wind turbine scale. Conversely when concerned for education, respondents perhaps had less tolerance toward greater scales becoming the minimum unacceptable wind turbine scale.

6.3.3. Planning Tool? Context, Explanation and Hypothetical Value

Rationale for question C was, that as aforementioned responsive participation may be the answer when working toward sustainability, although given ‘concerns’ appear drivers of the scale of wind turbine development in the case of turbine capacity estimates in Jones et al (2011) and thresholds for cumulative effects Ladenburg and Dahlgaard (2012), it also appears partial responsibility rests with developers providing the ‘correct’ information in a planning application specifically relating to areas of public concern. Given the focus in planning upon ‘impact’ evidenced in the context of the environment (Council Directive 2011/92/EU), based on results here where locals are unwilling to act locally (see, 5.2 and 5.3) it appears ‘effects' could carry more value to the local public toward local sustainability. Local people ultimately live with the development and consequences (positive and negative), thus surely reasonable for their concerns to be specifically addressed by planners and developers.

With that in mind, question C is not a result, only an idea of a potential tool to better understand areas of citizen concerns. Such concerns do not always fall within the abovementioned material considerations definition specifically ‘use or development of land’ therefore are seldom considered in their entirety within Welsh planning applications. The idea here was to ‘see’ if any sustainable development factors (Table 1) play a role in determining the threshold of the minimum unacceptable scales’ of wind turbine development. Below is a brief discussion about output information (Table 5), had the regressions’ been statistically significant, compared to literature followed by a brief description comparing variables’ (Table 6).

Minimum unacceptable wind turbine scales’ were regressed with areas of concern revealing both logical outcomes and anomalies. Considering regression 1 (Table 5),
employment was positively related to minimum unacceptable wind turbine height (Figure 16). This result appears reasonable given the literature notes potential large increases in employment opportunities due to turbine development globally (Mostafaeipour, 2010). Equally, planning applications for turbine development typically note direct employment opportunities to slightly increase (Powys County Council, 2012c). Conversely, education was closest to being a significant explanatory variable of minimum unacceptable turbine height. Concern for education had a negative relationship with minimum unacceptable turbine height thus, greater concern for education, the lower minimum unacceptable height respondents would be inclined to select, meaning more turbine height becomes ‘unacceptable’ (Figure 17). This appears a potential anomaly as at least one study, Kahn (2013) shows turbine development is capable of positive effects on education by increasing per pupil expenditure due to higher tax receipts in major turbine Counties in Texas compared to non-major turbine Counties (see, 2.4.3). Given the content of two wind farm planning reports (Powys County Council, 2012b and 2012c), education is not presently considered part of the decision-making process despite Kahn’s (2013) results, and education almost being a significant explanatory variable in this study.

As respondent attitudes were assessed, comparing variable importance can quantitatively show which areas of concern are held with greater or lesser importance and the direction of minimum unacceptable turbine scale whether more or less tolerant. Practical interpretation of this information includes, where concern for education led to respondent tendency to select less (negative) height as the minimum unacceptable turbine height. This tells a developer that citizen concern for education is likely to give rise to opposition to a proposal of an unacceptable wind turbine height. Comparing importance provides further information suggesting to policymakers and developers for minimum unacceptable wind turbine height, concern for education was held with greatest importance relative to other variables (Table 6). This could provide two purposes. Firstly provides starting points and strong suggestions to developers to begin community responsive involvement. Perhaps asking further information from the community so a developer is enabled to provide evidence to allay their concerns and/or provide further justification for the scale of turbine proposed considered unacceptable by the community. Secondly, it empowerment the local community to meaningfully consider the development and seek local benefits which in their view works toward sustainability in their area.

Jones et al (2011) amongst others have asserted the value of early, sustained and in-depth collaboration between developers and host-communities. An observation the results in 5.2 and 5.3 appear to support. A methodological problem in this study is measuring a ‘unit’ of local public concern; how can we know what a ‘unit’ of concern is for education? In practise this is not relevant. If a planning authority surveys a representative sample of their inhabitants, they can then produce a broad model for the County which should never be totally relied upon although potentially help shortening political distances. Assuming the models above (Table 5) were representative of Powys, if a developer wants to build a 100 metre high wind turbine, they immediately know it is 55m ‘unacceptable’ given mean acceptable height was 45m. Subsequently developers can ‘see’ the regression model and identify areas of concern to local communities and perhaps use their specific questionnaire response. This empowers communities as it tells developers what is, and is not acceptable. Coupled with an understanding of respondents’ attitude importance (Table 6), this creates a shortening of the social distance between developers and communities providing starting points (areas of concern) for meaningful dialogue regarding a turbine proposal. This approach is yet to be practically tested although may offer a starting point in beginning local sustainability conversations.
CHAPTER 7–CONCLUSIONS

‘Philosophers have interpreted the world in various ways; the point however, is to change it’

Karl Marx (1845)

Academics contend sustainability asks what kind of world do we want to live now and in future. With improvements in science and technology, answers to the question will change over time therefore, thinking of sustainability as integrative, a conversation and a moving target we all strive toward enables sustainability to ‘move with the times’. For sustainability to work properly it appears local public involvement is fundamental from the literature and results from the small sample in this study.

Almost all results here are insignificant meaning general conclusions cannot be drawn from survey data. However, using conceptual leverage respondents were of the opinion renewable energy and wind turbines form part of working toward sustainable development (Figure 10). Equally, the majority of respondents responded they were at least concerned with achieving sustainable development (Figure 9). Such results are encouraging for policymakers suggesting communities are willing to discuss and become involved with working toward sustainability. Value of such results is increased by the result that these attitudes do not translate into a willingness to act locally for global benefit (Figure 12). This suggests a shortening of social and political distances is necessary where responsive involvement, not just consultation, is needed when working toward local sustainability, providing building blocks toward global levels of sustainability.

Regarding question B, respondents selected various acceptable turbine scales’ with mean acceptable scales of 45m height, 10 turbines and 1300m distance therefore suggesting some turbine development may be tolerated, not necessarily supported (5.3). Such results are weakened considerably given the large standard deviations.

Regarding question C, variables included in regressions to explain ‘unacceptable’ turbine scales, over the 45m acceptable height, more than 10 turbines, but less than 1300m distance, were not significant (Table 5). Of greatest value when working toward sustainability, is perhaps the comparative importance of variables suggesting what may be the most important concerns amongst respondents (Table 6). The method is intended to be adaptable. Such a methodology may be useful to guide housing developers toward what are unacceptable scales of housing development for a given area amongst other examples. Variables included in such models, like the 6 X-variables here, could ‘indicate’ which areas of concern potentially explain the threshold between what is acceptable and unacceptable. Given decision-making authorities decide in the public interest, a simple model of public concerns may be useful to policymakers writing policies controlling development in the public interest when working toward sustainability.

In conclusion to the aim, the role of locally produced renewable energy appears important to respondents insofar as acknowledging it is necessary as part of sustainable development although this does not translate into acting locally to produce renewable energy. In the case of wind turbines there appears a broad scale of turbine acceptance despite large ranges and high standard deviation values from the mean. If local communities are expected to act locally toward achieving global sustainability, social and political distances likely need decreasing creating opportunity for empowering communities through responsive involvement in sustainable development processes.
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Sustainable ‘land use’ Development

Paul Watson
Sustainable 'land use' Development


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owres.pdf [Accessed: 12/May/2014]


Appendix
Appendix A – Questionnaire of Powys Town and Community Councils

Department of Geography and Economic History
Master Program in Spatial Planning and Development
Master Thesis Research

Questionnaire

‘Sustainable ‘land use’ Development? Exploring the tension between acting local and thinking global: a case study of public opinion toward Wind Turbines’ in Powys, Wales

Valid and credible research provides evidence for improved policies to better manage our resources now and for future generations. This research will be a component of a much larger body of academic literature on ‘Sustainable Development’ regarding land use practice, and built development in the public interest.

I would be sincerely grateful to take some of your time to answer the following questionnaire for my research. All responses to this questionnaire will be anonymous and treated with confidentiality.

Responding
Please answer every question where check boxes have been provided in order for the questionnaire to be valid, useable, and unbiased. ‘Comment boxes’ do not need responses but are provided if you wish to make additional comments.

This questionnaire can be completed electronically by double-clicking on the chosen box and changing the ‘Default Value’ to ‘Checked’ from ‘Not checked’. Example of a ‘checked’ box is ☑. Responses can be emailed to pawa0013@student.umu.se for ease and convenience.

However, if you prefer to post your response, please print the questionnaire, complete it and post it to,

Paul Watson, Department of Geography and Economic History, Umeå University, Umeå, Sweden, 901 87

Please return a completed questionnaire before Thursday 20th March 2014. I sincerely thank you very much for your time and efforts in advance.

IF NEEDED – Brief background
This questionnaire asks your Town or Community Council opinion on,

1) whether or not sustainable use (socially, economically & environmentally) of our land is happening now and for future generations when we say ‘Yes’ to planning applications and allow developers to build things on, in or under the land.

2) whether or not building onshore wind turbines is part of achieving ‘sustainable development’.

3) whether or not there is a scale of wind turbine development the public considers broadly acceptable, and,

4) concerns that you may have toward wind turbine development as an elected representative of the public.

The phrase ‘act local, think global’ is often used under the overarching term of ‘sustainable development’, and places a high priority on local communities accepting development for the benefit of a global community. There is a tension here between acting local and thinking global which is currently being tested by onshore wind turbines being placed in the local landscape. Therefore, onshore wind turbine development is used in this questionnaire to better understand public opinion on whether or not wind turbines can be considered part of sustainable development, and better understand the local-global tension in terms of areas of local concern.
QUESTIONNAIRE starts here...

INFORMATION FOR COMPARISON – Please mark ONE box for each question

Which Town or Community Council do you represent in Powys?
___________________________________ Town / Community Council area

How many elected members are in your Town or Community Council?
___ Males ___ Females

How old is the oldest elected member of your Town or Community Council?
___ years old

How old is the youngest elected member of your Town or Community Council?
___ years old

Highest education amongst elected members of your Town or Community Council?
High School □ College □ University □

Does any elected member work for a renewable energy company or a company contracted by a renewable energy company to gain planning permission, install, maintain, transport, or decommission any renewable technology from wind turbines, solar panels, biomass boilers to nuclear power stations etc?

I need to know if a member plays a working role in the process of renewable energy technologies being built

Yes □ No □

Can any member of the above Town or Community Council see an existing or proposed Wind Turbine site from their house?

Yes □ No □

Does any member of the above Town or Community Council financially gain personally from 1 or more Wind Turbines occupying their land?

I need to know if any member personally gains money from having wind turbines on their land, or have an option agreement with a company and likely to have 1 or more on their land?

Yes □ No □
Does any member financially gain personally from 1 or more Wind Turbines in any other way?

I need to know if a member personally gains money from renewable energy companies. Examples include through dividend payments from investment shares in a renewable energy company, or by having some or all electricity bills paid for by a renewable energy company.

Yes [ ] No [ ]

Does your Town or Community Council currently receive any money from wind turbine development?

I need to know whether your community is being paid money by a renewable energy company and/or they pay electricity bills etc.

Yes [ ] No [ ]

Has your Town or Community Council been offered money from a wind turbine development or company?

I need to know whether your community has been offered money by a renewable energy company or offered to pay electricity bills etc.

Yes [ ] No [ ]

GENERAL ATTITUDE – Please mark ONE box for each question

1. What is your general opinion to renewable energy generation?
   - [ ] No opinion
   - [ ] Very unfavourable
   - [ ] Unfavourable
   - [ ] Favourable
   - [ ] Very favourable

2. In your opinion, is renewable energy a good method of energy production?
   - [ ] Yes
   - [ ] No
   - [ ] I do not know

3. In your opinion, are wind turbines a good method of energy production?
   - [ ] Yes
   - [ ] No
   - [ ] I do not know
4. Do you think the way we currently use our land is socially, economically and environmentally sustainable?
- [ ] Yes, I think we are
- [ ] No, I think we are not
- [ ] I do not know

5. How concerned are you about achieving sustainable development?
   Brundtland report (1987) notes, sustainable development is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'
   - [ ] Definitely not concerned
   - [ ] Unconcerned
   - [ ] Neither unconcerned or concerned
   - [ ] Concerned
   - [ ] Definitely Concerned

6. In your opinion, is renewable energy part of achieving sustainable development?
- [ ] Yes, I think so
- [ ] No, I think not
- [ ] I do not know

7. In your opinion, are wind turbines part of achieving sustainable development?
- [ ] Yes, I think so
- [ ] No, I think not
- [ ] I do not know

8. In your opinion, are people fully or at least partly responsible for climate change?
- [ ] Yes, I think so
- [ ] No, I think not

9. To what extent do you agree or disagree with the following statement?
   'I would be prepared to accept unfavourable development in my local community area for the benefit of a global community.'
   - [ ] Definitely do not Agree
   - [ ] 1
   - [ ] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5
   - [ ] 6
   - [ ] Definitely Agree
   - [ ] 7
Figure 1. Graph above shows approximate sizes of typical three-bladed wind turbines measured in metres (m). For comparison, a standard 2 floor house would be in the order of 10m height. A typical fully grown Scots Pine tree is around 20m height.

10. Only thinking about wind turbine HEIGHT, in your opinion what would be an acceptable maximum height of a wind turbine from the ground to wind turbine blade tip if you stood on a hill and looked over the open countryside before you thought ‘too high’?

<table>
<thead>
<tr>
<th>Height (metres)</th>
<th>Please mark ONE option</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 metres</td>
<td></td>
</tr>
<tr>
<td>15 metres</td>
<td></td>
</tr>
<tr>
<td>30 metres</td>
<td></td>
</tr>
<tr>
<td>45 metres</td>
<td></td>
</tr>
<tr>
<td>60 metres</td>
<td></td>
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<tr>
<td>75 metres</td>
<td></td>
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<tr>
<td>90 metres</td>
<td></td>
</tr>
<tr>
<td>105 metres</td>
<td></td>
</tr>
<tr>
<td>120 metres</td>
<td></td>
</tr>
<tr>
<td>135 metres</td>
<td></td>
</tr>
<tr>
<td>136+ metres</td>
<td></td>
</tr>
</tbody>
</table>
11. If a developer wants to build a wind turbine ABOVE the HEIGHT in your answer to question 10, how concerned would you be of an effect in your local community on the 'Areas of Interest' below?

<table>
<thead>
<tr>
<th>'Areas of Interest'</th>
<th>Definitely not Concerned</th>
<th>Definitely Concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport and Mobility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Only thinking about the NUMBER of wind turbines, in your opinion how many wind turbines (all the same size) would be acceptable if you stood on a hill and looked over the open countryside before you thought ‘there are too many’?

<table>
<thead>
<tr>
<th>Number of Turbines</th>
<th>Please mark ONE option</th>
<th>Any comments?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 turbines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 turbines</td>
<td></td>
<td></td>
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<tr>
<td>10 turbines</td>
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<td></td>
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<tr>
<td>15 turbines</td>
<td></td>
<td></td>
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<tr>
<td>20 turbines</td>
<td></td>
<td></td>
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<tr>
<td>25 turbines</td>
<td></td>
<td></td>
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<tr>
<td>30 turbines</td>
<td></td>
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<tr>
<td>35 turbines</td>
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<tr>
<td>40 turbines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 turbines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46 + turbines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. If a developer wants to build wind turbines ABOVE the NUMBER in your answer to question 12, how concerned would you be of an effect in your local community on the 'Areas of Interest' below?

<table>
<thead>
<tr>
<th>'Areas of Interest'</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Education</td>
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<td>Population</td>
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<tr>
<td>Human Health</td>
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<tr>
<td>Climate Change</td>
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</tr>
<tr>
<td>Transport and Mobility</td>
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</tbody>
</table>

14. Only thinking about DISTANCE of a wind turbine, in your opinion what would be an acceptable distance for a wind turbine from houses and schools etc in the open countryside?

*NOTE* – 1600 metres (1.6km) = 1 UK mile

<table>
<thead>
<tr>
<th>Turbine distance (metres)</th>
<th>Please mark ONE option</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 metres</td>
<td></td>
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<tr>
<td>200 metres</td>
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<tr>
<td>400 metres</td>
<td></td>
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<td>600 metres</td>
<td></td>
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<tr>
<td>800 metres</td>
<td></td>
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<tr>
<td>1000 metres</td>
<td></td>
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<td>1200 metres</td>
<td></td>
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<tr>
<td>1400 metres</td>
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<tr>
<td>1600 metres</td>
<td></td>
</tr>
<tr>
<td>1800 metres</td>
<td></td>
</tr>
<tr>
<td>2000+ metres</td>
<td></td>
</tr>
</tbody>
</table>
15. If a developer wants to build a wind turbine BELOW the DISTANCE in your answer to question 14, how concerned would you be of an effect in your local community on the 'Areas of Interest' below?

<table>
<thead>
<tr>
<th>‘Areas of Interest’</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td>Employment</td>
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<tr>
<td>Education</td>
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<tr>
<td>Human Health</td>
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<tr>
<td>Climate Change</td>
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<td></td>
</tr>
<tr>
<td>Transport and Mobility</td>
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Again, please mark ONE box for each question

16. Given the choice, from the following options where would you prefer to see wind turbines in the open countryside?

- [ ] Only in small areas of the countryside
- [ ] Spread across the countryside wherever there is wind
- [ ] Does not matter provided that over the turbine lifetime they produce more energy than goes into making and transporting them into the landscape.
- [ ] Other (please specify) ________________________________
  ________________________________
  ________________________________
17. Every proposal for development will have benefits and harm to each of the following areas although in general, which facet should be given the most weight (giving it more importance) when deciding ‘Yes’ or ‘No’ on a planning application for the benefit of the general public and toward achieving sustainable development?

- Equal balance of all three, social, economic and environmental with one never taking priority over another
- Social
- Economic
- Environmental
- Social & Environmental
- Economic & Environmental
- Social & Economic

18. What other 'Areas of Interest' should be added to the 6 listed in questions' 11, 13 and 15? Essentially, if a developer had to provide you evidence of any effects when working toward achieving sustainable development, what would you like to know about?

For example, should other specific information be included in a planning application? Examples in a wind turbine context perhaps include,

- whether or not wind turbines have an effect on local or regional house prices,
- the business and structure of the Developing company, organisation or individual. Sometimes companies are part owned by other governments thus they gain financially.
- how long it would take for a given wind turbine to re-pay the energy used from the mining of materials, manufacturing and processing to installation when it runs at actual efficiency.
19. Anything further you would like to add? (If handwritten, please write in readable English)

Refer back to previous questions if you wish.

Diolch yn fawr iawn!

I sincerely thank you very much for your time and efforts with this questionnaire!

Tack så mycket för att du tagit dig tid att svara på frågorna!

Paul Watson