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Tensions, capabilities, and justice in climate change mitigation of fossil fuels

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ABSTRACT

In order to mitigate the well-being impacts of climate change effectively, we must reduce our use of fossil fuels. However, many contemporary forms of well-being attainment still depend heavily on the use of fossil fuel derived energy. Therefore, certain necessary forms of climate change mitigation are likely to conflict with current means of well-being attainment in many groups and societies. In particular our concern is that certain forms of mitigation, which target lifestyle choices, consumption behaviour, and technological choices, do and will have disproportionate impacts on certain vulnerable groups in society e.g. households in fuel poverty or individuals with particular disabilities. It is evident that climate change mitigation discourse has only sparsely integrated well-being thought. We argue that a fuller integration of well-being into mitigation thinking could help avoid exacerbating current and future well-being conflicts that will arise between climate change mitigation and fossil fuel derived use.

To help achieve this, we reason that climate change mitigation and fossil fuel derived use must not be viewed separately but by their relationships to well-being. We articulate the individual processes of fossil fuel derived energy use, climate change mitigation and well-being attainment in more detail, presenting their relationships to one another in the form of tensions. We present a capabilities conception of well-being that we argue is best suited for operationalising well-being with regards to fully capturing these tensions. We then develop a conceptual framework through a theoretical synthesis of existing on well-being, energy, and climate change, which illustrates how these tensions arise. This framework also serves to illustrate how a change in one process will affect the others. We outline how this framework can help illustrate the points at which misguided climate change mitigation can conflict with current means of attaining well-being from fossil derived energy. We then conclude that the use of this framework and further integration of well-being thought could help avoid and ameliorate well-being conflicts when developing future climate change mitigation.

1. Introduction

Energy plays a role in the attainment of well-being [1–3] and its absence can be a contributing factor to well-being deprivation [4–7]. It is also the case that many of the energy services and goods on which well-being attainment partly depends are currently powered by, or in part produced using fossil fuel derived energy (FFDE) e.g. current means of transport, heating, lighting and energy production [7–10]. We therefore take FFDE to currently be a key, but extrinsic component of well-being attainment of many people around the world.

It appears that energy use naturally intertwines with the attainment of well-being.¹ However, the results of intensive energy use and production (in particular fossil fuels derived energy) can have converse

impacts on well-being attainment globally² [11–13]. Climate change is a prominent example of this. Primarily the result of greenhouse gases (GHGs) from the excessive use of FFDE, climate change has and will continue to have substantial and widespread, negative global well-being impacts [14,15]. To mitigate these impacts we must significantly reduce GHG emissions [16]. In many cases this means reducing or changing consumption behaviour and lifestyles which we ordinarily rely on to attain well-being (we refer to these as a type demand-side mitigation and these forms of mitigation are our main focus throughout this paper) [17–19].

It is evident that tensions exist between well-being attainment, FFDE use and climate change mitigation (CCM). As Creutzig et al. [19] suggest reducing energy use and GHG emissions must be balanced with

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¹ It is important to note that after a point energy intensive pursuits have diminishing and limited abilities to deliver gains in well-being [74,75].

² Including impacts of extraction and global supply chains, see [11] and [13].

the goal of enhancing human well-being. A challenge arises, however, when noting the limited incorporation of well-being into CCM discourse. In a review of human well-being and climate change mitigation, Lamb and Steinberger [18] state ‘climate change mitigation is fundamentally motivated by the preservation of human lives and the conditions which enable them’. Despite this ostensibly true claim, they find the field has so far failed to incorporate well-being thought beyond a superficial level [18]. A pertinent example is the United Kingdom’s Climate Act, which sets out clear targets for emissions reductions but does not refer to well-being once [20].³ Indeed, when exploring the acceptance of energy transitions Demski et al. [21], found values associated with needs and justice, such as fairness and equity are perceived by the public to be side-lined or even absent. Outputs from *Just Transition* and *Energy Democracy* discourses have included the concept of well-being to a limited extent, largely within the design of qualitative studies. McCauley and Heffron [22] note this shift from quantitative to qualitative focuses on dimensions of injustice within environmental, climate, and energy justice scholarship, with studies focusing on more procedural aspects of research. For example, Damgaard et al. [23] utilise the capabilities conception of well-being when assessing the energy justice implications of bioenergy developments in Nepal. However, a robust conceptualisation of the relationships between well-being, energy, and CCM is lacking. In particular there is limited examination of the extent to which well-being issues which result from the combustion of fossil fuels and CCM can be framed as justice issues using the same theoretical lens.

In essence links between well-being and CCM are being made, but there is a need to integrate this into CCM more effectively. This must be done whilst recognising that well-being is currently strongly linked to FFDE use, in order to recognise and address the implications of CCM strategy on FFDE-dependent means of attaining well-being.

These processes and the relationships between them are complex and need to be communicated more effectively. Therefore, in Section 2 we articulate these processes in more detail along with the tensions and relationships between them. In Section 3 we present a capabilities conception of well-being which lends itself to being operationalised within this context, arguing that a broad, holistic conception of well-being must be used in order to more fully capture these tensions. In Section 4 and 5, using this conception of well-being, we develop a new framework through a theoretical synthesis⁴ of existing conceptualisations of the relationships between energy use and well-being, and the links between well-being and environmental issues. Finally, in Section 6 we discuss the implications and uses of our framework as a tool and guide for assessing and developing CCM strategies.

We argue that it is not just the links between CCM and well-being that require substantiating, but also the conception of well-being which we utilise to illustrate them. As such, we draw from, and expand on, substantial existing work on the capabilities approach, utilising it as a means of assessing a person’s freedoms, opportunities, and abilities to attain well-being [1,7,12,24–27]. We take well-being to be tantamount to attaining sufficient levels of Nussbaum’s Central Human Capabilities, enabling a person to live a life of dignity [1]. Importantly, the capabilities approach frames the ability to attain well-being as a matter of justice, and conversely that the deprivation of capabilities constitutes an injustice [1]. This enables us to frame the potential well-being implications of CCM-fossil fuel energy conflicts as justice issues, which we believe to be an important contribution to grounding energy justice

within philosophical discourse. We also highlight that the work within the capabilities approach can incorporate distributive, procedural and recognition components of justice [12,27–29]. We suggest the framework becomes most useful when combined with information about vulnerable groups, in particular those with already pressing needs and requirements for which extra access to energy is essential. We illustrate the benefit of continuing this work within the capabilities space. We outline the expansive tool set the capabilities approach yields as both a normative framework, which can guide the development of CCM, and a partial theory of justice which can assess current and potential injustices caused by disruption to current means of well-being attainment.

2. The tension triangle

Here we provide more clarity on the tensions and relationships between FFDE use, CCM and well-being attainment. We find a useful way to visualise this, is in the form of a triangle (Fig. 1). At each point on the triangle sits a process; FFDE use, well-being attainment or CCM, with each process sitting in relation to the adjacent processes.⁵

We refer to ‘tensions’ as the relationships between these processes that pull in different directions e.g. the use of FFDE to attain well-being conflicts with well-being implications of climate change which is caused by FFDE use. These tensions arise primarily from two conflicting processes. First, our dependency on fossil fuels for well-being provisioning energy services leads to excessive GHG emissions and climatic change. Second, the resulting climate change poses large scale well-being issues, which to avoid, or at least reduce, requires substantial mitigation efforts [30].

In order to understand how these issues relate to one another, we need to assess the issues driving these tensions through a well-being lens. To help better understand the importance of these processes in terms of well-being we briefly outline the links between well-being and FFDE use, and well-being and climate change.

2.1. FFDE use and well-being

There are both positive and negative connections between well-being and FFDE use, it is these connections which create a tension between the two processes. The positive connection between FFDE use and well-being lies in the general relationship between energy use and the attainment of well-being. However, the majority of nations still rely predominantly on the combustion of fossil fuels to derive energy [31]. As such, many relationships between well-being and energy that exist are currently facilitated by FFDE.⁶ Perhaps most prominently the relationship between energy and well-being can be seen within developmental literature. Development itself is hailed as a major source of well-being enhancement [1,24]. Energy is acknowledged to play a prominent role within this, having a positive impact on productivity, health, education, safe water and communication services process [32–34]. FFDE in particular is paramount to many forms of well-being maintenance, such as household heating, heat for cooking, and many contemporary forms of transport, which enable access to a greater range of well-being enhancing services such e.g. education, healthcare, recreational areas [9,35]. Malakar et al. [36] argues that shifting

⁵ CCM, fossil fuelled derived energy use and well-being attainment could also be described as outcomes.

⁶ It is important to note therefore that other renewable sources of energy could replace fossil fuel use and still provide similar means of well-being attainment. However, at a certain point increasing energy consumption does not appear to contribute to gains in well-being [73]. Therefore a focus on maintaining and attaining other means of well-being may help partially decouple the energy-well-being relationship, and could provide avenues to maintain well-being whilst mitigating climate change [52]. It is also worth noting that the introduction of renewable energy sources does not necessarily displace the use of fossil fuels [77].

³ PDF word search feature for ‘well-being’, ‘wellbeing’, ‘health’, ‘welfare’, ‘inequality’, & ‘equality’ – although ‘needs’ arises once in regard to taking account of the needs of citizens unduly disadvantaged by waste reduction programmes.

⁴ We use this term based on the definition given in Sovacool et al. [76] on promoting novelty, whereby the theoretical synthesis entails integrating existing theories on concepts into a new conceptual framework.

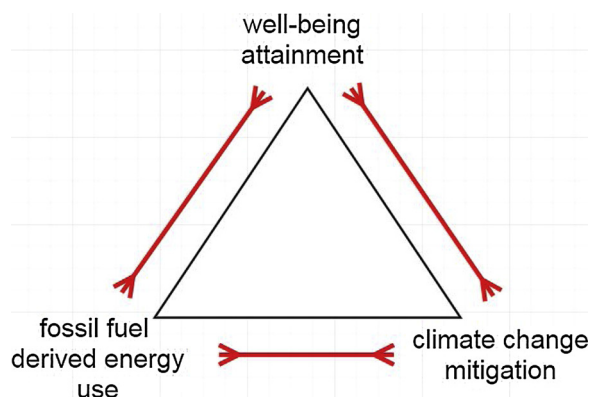


Fig. 1. 'The Tension Triangle' illustrating how FFDE use, well-being attainment, and climate change mitigation sit in tension to one another.

towards the use of modern energy carriers such as electricity, liquid petroleum and natural gas, could eliminate the well-being constraints associated with the use of solid fuels such as wood, dung and crop residue within the developing nations – of course this shift might contribute to other issues regarding growing GHG emissions.

The importance of energy in attaining well-being is echoed within justice literature. Sovacool et al. [37] argue that people have a derivative entitlement to energy services if any of the basic goods which they are justly entitled to can only be secured through the use of energy services. In essence, if energy services are the only means through which an individual might achieve a particular good or state of well-being that a theory of justice prescribes, then energy becomes an entitlement of that individual.

The negative relationship between FFDE use and well-being we focus on here is climate change.⁷ It is well established that the combustion fossil fuels, and the subsequent greenhouse gas emissions, are the largest contributor to ongoing climate change [38]. Climate change continues to have well-being impacts throughout the globe including an increased frequency of severe weather events, disrupted weather cycles, and irreversible damage to provisioning ecosystems [15].

Both global inequality and the regions subject to significant climate hazards renders developing nations particularly vulnerable [39]. Sea temperature increase will further contribute to global food security concerns, particularly as many vulnerable nations depend on seafood as a primary source of protein [80], with studies observing habitat destruction and fish stock migration in line with ocean warming [79]. Rising temperatures will also contribute to sea-level rise, which poses the threat of coastal flooding to regions in which a growing proportion of humanity resides [81]. An increased frequency of flooding and droughts will be a growing source human suffering especially in the global south [15]. Within the global south, women and children are thought to be particularly vulnerable to abuse during these events [40]. For example, during times of drought, many young women in Ethiopia and Bangladesh were obliged to labour for cash in local towns, forgoing education opportunities in doing so, and increasing their exposure to potential abuse and exploitation [41]. Although by no means exhaustive, this list illustrates some of the potential and ongoing impacts to human well-being that climate change poses.

These relationships illustrate the positive and negative well-being implications of fossil fuels which create an intrinsic tension between FFDE use and well-being attainment.

⁷ It is important to note that the extraction, production and combustion are linked to and the cause of a plethora of well-being issues throughout the globe, for example, land rights issues, air pollution, environmental degradation at the point of extraction etc. [13,11].

2.2. Climate change mitigation and well-being

As with the relationship between FFDE use and well-being attainment, the tensions between CCM and well-being attainment, manifest through two relationships, one positive and one negative.

The positive relationship occurs through CCM's motivation to preserve well-being attainment and to prevent further well-being deprivation that will occur through unchecked climate change. To avoid or minimise the well-being impacts of climate change discussed above we must implement broad forms of mitigation, a necessary means of doing so is to reduce our use of FFDE [30]. CCM is primarily motivated by the maintenance of current systems of well-being attainment e.g. well-being provisioning systems, a stable climate and the issues we outline in Section 2.1 [42]. Although climate change is already having widespread well-being impacts, prompt and effective mitigation could help avoid or minimise these in the future [16].

The negative relationship between CCM and well-being arises through certain forms of mitigation, in particular demand-side mitigation, which requires broad changes to consumption habits and lifestyles. In essence we must restructure many current means of well-being attainment, such as those listed in Section 2.1 above. However, attempts to curtail certain consumption choices and dis-incentivise certain activities may impact certain groups more than others e.g. low income households, those with disabilities or susceptibility to illness, and elderly demographics [35,43]. Numerous studies illustrate the regressive impacts of carbon taxes, energy policy, and carbon trading, which are frequently criticised for disproportionately impacting low income and vulnerable groups [44–50]. A pertinent example are UK energy policies which are designed to support a transition towards a low carbon energy system. The UK government added a levy to household energy bills, 20% of which is used to fund energy efficiency improvements within homes i.e. installing insulation and other energy saving measures. However research by Barrett et al. [50], found that the UK's poorest households spend 10% of their income on energy, whereas the richest spent only 3%, meaning the levy on energy bills disproportionately impacted low income households. Wier et al. [51] found that energy needs for rural households were greater than those of urban households. Such disparities suggest forms of mitigation such as carbon taxation and carbon trading may impact rural homes disproportionately [44].

These two relationships, illustrate that CCM's motivation to preserve well-being may in some cases result in the curtailing of peoples well-being elsewhere.

2.3. FFDE use and climate change mitigation

Sections 2.1 and 2.2 illustrate that both CCM and FFDE use are linked through their conflicting means of preserving and delivering well-being attainment. Thus we can see a direct tension between CCM and FFDE use, it is unlikely we can continue one process without disrupting the other. If we continue to combust fossil fuels for energy use, our ability to curb climate change through effective mitigation will be curtailed. Likewise, if we implement effective CCM it is likely that we will not be able to depend on FFDE for current means of well-being attainment. As a result, we can see that CCM and FFDE use sit in direct tension to one another.

We find that in order to fully capture the tensions between CCM and FFDE use a robust and holistic conception of well-being must be utilised. Dominant forms of assessing well-being have largely been hedonic, focusing on maximising utility through satisfying commensurable and transitive preferences [52]. A lack of stability in peoples preference's make such approaches to well-being poor assessors of social policy and systems that contribute to well-being attainment [53]. By extension we believe hedonic conceptions of well-being also make poor assessors of the well-being attainment we derive from the environment (the process that CCM is motivated to protect). Brand-Correa

and Steinberger [52] argue that eudaimonic conceptions of well-being, through focusing on how a person in the broader context of their society can flourish, lend themselves to analysing the role of social institutions and political systems in the attainment of well-being. Again, by extension, we believe eudaimonic approaches to well-being can make for clearer and more robust assessments the links between the environment and well-being attainment. Assessing these links is paramount to outlining the well-being implications which are motivating CCM and how these conflicts with forms of well-being attainment from FFDE use.

In the following section we argue that the capabilities approach provides a broad and robust eudaimonic conception of well-being, through which we can conceptualise the issues embodied in tension triangle. Later in the discussion we use this conception to illustrate how certain forms of mitigation can result in well-being conflicts.

3. Introducing capabilities

We opted to use the capabilities approach for its applicability as a normative framework and as a partial theory of justice, as well as the substantial contributions and expansions which provide the conceptual infrastructure for our own contribution.

Conceptions, such as Martha Nussbaum's, which we expand on later, outline the approach as a 'partial theory of justice' in that it provides a specific list of capabilities of which each person should possess at least threshold level of, where any level below this threshold constitutes an injustice [1]. As a partial theory of justice, it cannot inform on all matters of social justice. However, as we go on to explain, expansions and contributions to the approach yield enough scope to enable us to produce a framework that captures and reflects many of the justice issues which arise from both climate change and CCM. Whilst illustrating these injustices, the approach also enables us to inform where policies might be improved as to avoid further injustices. Just as these principles can constitute what situations amounts to an injustice they can also help as guide in avoid the creation of new injustices as it can provide a guide to which factors we should consider when making decisions that impact people and societies, in the case of our paper, how we should mitigate climate change. This is what we mean by using the approach as a 'normative framework'. Within development ethics, for example, the approach can be utilised as a normative framework e.g. describing how a policy or society should be. The approaches falls into the eudaimonic category of well-being approaches focusing on the Aristotelian conception of flourishing [1].

Importantly, capabilities offer a holistic understanding of well-being, making two normative claims. First, that freedom to achieve well-being is of upmost moral importance. Second, that freedom to achieve well-being should be understood in terms of people's opportunities to achieve valued functionings i.e. their capabilities [1,54]. The capabilities approach revolves around two main concepts: 'capabilities' and 'functionings'. Capabilities are a *'person's freedom to achieve valued functionings'* and 'functionings' can be categorised as either 'beings or doings' [55]. 'Beings' for example, could mean being educated, being well nourished, being housed in a warm home. 'Doings' could mean voting in an election or making use of adequate fuel to heat one's home.⁸

Instead of focussing on the distribution of resources, as many accounts of justice do, the capability approach focuses on what people are able to do and achieve, in part based on their capacity to convert primary goods into meaningful outcomes in their life; 'an individual's capability to function' [56]. Although here our main focus is on the processes outlined in the tension triangle, this perspective become useful in regards to climate change in general, which has disproportionate impacts on particular marginalised groups around world, based

on gender, ethnicity, geography and inequality [15,27,40,41]. For the same reasons this makes the approach useful for assessing the impacts of CCM strategy, which as noted impact different groups depending on their social and physical situation. As we expand on later, the approach embodies elements of procedural and recognition justice, [27,28], elements which are also pertinent to energy justice theory [29].⁹

The capabilities approach has played a key role in framing international development, particularly in the human development index [57,58]. Further, the approach has been used in framing issues of global gender inequality and disabilities [1,59]. Similarly, the capabilities approach has proven beneficial within environmental and energy literature [7,12,25,60].¹⁰

Various uses have led to extensions, reinterpretations, and new abstractions. Sen's conception of capabilities and functionings is broadly open to interpretation based on the values and deliberative processes within differing societies [24]. Alternately, Nussbaum's conception, proposes a list of incommensurable 'central human functional capabilities' essential for human dignity [1]. Nussbaum argues that these capabilities have no relative weight and therefore cannot be ordered by priority. Hence, she argues, that the state should provide each citizen with a minimum level of each capability. Her list contains relatively abstract conceptions of capabilities:

- 1 **Life.** Being able to live to the end of a human life of normal length, not dying prematurely, or before one's life is so reduced as to be not worth living.
- 2 **Bodily health.** Being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter.
- 3 **Bodily integrity.** Being able to move freely from place to place; having one's bodily boundaries treated as sovereign.
- 4 **Senses, imagination, and thought.** Being able to use one's mind in ways protected by guarantees of education, freedom of expression with respect to both political and artistic speech and freedom of religious exercise.
- 5 **Emotions.** Being emotionally developed, able to have attachments to things and people outside ourselves; (Supporting this capability means supporting forms of human association that can be shown to be crucial in their development.)
- 6 **Practical reason.** Being able to form a conception of the good and to engage in critical reflection about the planning of one's life. (This entails protection for the liberty of conscience.)
- 7 **Affiliation.** (A) Being able to live with and toward others, to recognize and show concern for other human beings, to engage in various forms of social interaction; to have the capability for both justice and friendship. (B) Having the social bases of self-respect and nonhumiliation; being able to be treated as a dignified being whose worth is equal to that of others.
- 8 **Other species.** Being able to live with concern for and in relation to animals, plants, and the world of nature.
- 9 **Play.** Being able to laugh, to play, to enjoy recreational activities.
- 10 **Control over one's environment.** (A) *Political.* Being able to participate effectively in political choices that govern one's life; having the right of political participation, protections of free speech and association. (B) *Material.* Being able to hold property (both land and moveable goods), not just formally but in terms of real opportunity.

([1], 78–80)

Adapted and shortened for use in this paper, we recommend

⁹ How to operationalise capabilities and other justice theories using an energy justice framework is an issue we are working on in a separate paper. Although the framework we present later in this paper may aid in this task.

¹⁰ Energy and environmental health are both conceived to be essential in minimising gender inequality [59].

⁸ 'Being in a warm home' and 'making use of adequate fuel to heat one's home' are both aptly mentioned as examples of functioning in Robeyns [78]

viewing the full list in Nussbaum [1] p. 78–80.

4. Conceptual building blocks: linking FFDE, CCM, and capabilities

Nussbaum's abstractive list of capabilities provides a useful tool to explore and outline the processes through which we derive capability, functions and ultimately well-being. We find a number of contributions to the capabilities approach lend themselves to our aim of articulating in more detail the relationships embodied within the tension triangle. The tensions between CCM, FFDE use and well-being, are complex and have been largely overlooked, with each processes often being dealt with separately. Linking them within well-being framework will enable us to more clearly articulate where these processes might conflict and how these conflicts might be avoided in the future. The following sections expand on the tension triangle, outlining how the relationships embodied within it can be articulated in reference to the capabilities conception of well-being.

4.1. Environmental meta-capabilities and capability conflicts

Understanding the well-being motivation behind CCM, and the subsequent tension that this results in with FFDE use (the base of the tension triangle), depends on having a clear understanding as to how climate change impacts our ability to derive well-being from a stable environment. Holland [25] suggests that the majority of capabilities are dependent on certain environmental preconditions or 'meta-capabilities' i.e. we derive many capabilities directly from interaction with the environment. For example, both *bodily integrity* and *bodily health* depend on certain environmental factors e.g. clean air and water permit us to move freely from place to place without incurring negative health impacts. Holland goes on to argue that to ensure people can attain minimum required levels of capabilities for a life of dignity, ecological protection is required.

Another concept outlined by Holland [12], abstracted from Nussbaum [61] are *capability conflicts*. These are conflicts which occur between different means of well-being derivation. For example, a household near a river may derive sanitation, and thus *bodily health*, from using the river as a means of refuse disposal. However, a household downstream may use river as a source of drinking water to derive *bodily health*. But, the downstream household is now prevented from doing so because the refuse disposed of by the upstream household has rendered the water unpalatable and unsanitary.

Holland's notion of capability conflicts and meta-capabilities can help conceptualise the links and motivations between FFDE use, climate change mitigation, and well-being deprivation. The use of the atmosphere as a sink for GHG emissions, may allow a person to attain well-being from processes which require the combustion of fossil fuels for example, the combustion of fuel to power transport. This use over a large enough scale will contribute to the ongoing warming of the atmosphere. Many other people and societies (and indeed the very same people and societies), may derive many capabilities via the environmental services (or environmental meta-capabilities) that are supported by an atmosphere with stable temperatures. For example, stable weather patterns and temperature cycles which aid agricultural productivity, adequate drinking water and stable environments which enable the attainment of capabilities *bodily health* and *play*. We can see here that the extensive use of the atmosphere for the former purpose conflicts with the latter use.

Schlosberg [27] suggests that a capabilities approach to justice can aid in assessing a broad range of issues posed by climate change, arguing it is an approach which may help capture distributions of vulnerability, the impacts of mal-recognition, and the impairments to functioning climate change poses [27]. Drawing on Fraser [62], Schlosberg details how mal-, mis-, and non-recognition (for simplicity we refer to these issues collectively as misrecognition from here in)

leads to the neglect of peoples and cultures which are impacted by climate change in ways which threaten the preconditions for those cultures to exist and the attainment of capabilities within them [27]. Schlosberg argues that capabilities approach, through its deliberative nature may help ameliorate the recognition issues of local, individual, and community needs and vulnerabilities [27].

Schlosberg also suggests that misrecognition inhibits the fair participation of individuals and communities in deliberative and democratic procedures. And further, that these preconditions of participation and recognition depend broadly of the environment. Drawing on Holland's [25] conception of environmental meta-capabilities and Fraser's [62] concerns over recognition justice, Schlosberg holds that recognition is key to designing substantive policy responses to threats (climate change in particular) to human functionings and the incommensurable role of the environment in achieving them.

4.2. Capability from energy services

Understanding the well-being tension between CCM and FFDE use also requires an understanding of the process through which well-being is derived from services which depend on FFDE. Understanding this process, enables one to assess the points at which CCM might conflict with current means of well-being attainment from FFDE use. One incorporation of the capabilities approach is Day et al.'s [7] conceptualisation of the relationship between energy, energy services, and well-being outcomes. Day et al. [7] utilise capabilities to conceptualise the means through which we derive well-being from household energy services. They then outline the processes through which capability deprivation may occur or be prevented by either adequate or insufficient energy access respectively.

With reference to Sovacool et al. [63], Day et al. [7] argue that energy demand is not derived from an intrinsic want or need for energy, but instead arises from the services and activities that energy enables us to use and do. As such, they utilise the concept of secondary capabilities to conceptualise the links between the use of energy services and basic capabilities. Day et al.'s framework allows one to illustrate heterogeneity of services and subsequent capabilities derived from energy. This is in part achieved through the incorporation of Smith and Seward [26] conception of 'basic' and 'secondary' capabilities. Secondary capabilities here embody a positivist approach, in that they can be observed and measured, e.g. driving a car, using a washing machine, and utensils used in preparing food. Basic capabilities embody constructivist ideals, take e.g. Nussbaum's capability of *Affiliation*. There will be multiple ways in which we might define or view affiliation, such as being able to empathise, identify with, or physically meet individuals. A secondary capability such as driving or being in transit might facilitate these actions. Day et al. [7] aptly describe secondary capabilities as 'precursors to basic ones'. The adoption of secondary capabilities into a framework is essential for identifying the mechanisms through which basic capabilities are achieved [7,26].

Day et al.'s framework (Fig. 2) shows the use of fuel or energy sources, feeding into domestic energy or other power supplies, the energy's subsequent use in domestic services; it's utilisation in the form of secondary capabilities, and finally energy manifested in the form of basic capabilities. Each stage represents a transformation of energy.

This framework allows Day et al. [7] to formulate a definition of energy poverty within the space of capabilities, based on disruptions to this chain of derivation acting ultimately as forms of capability deprivation:

'an inability to realise essential capabilities as a direct or indirect result of insufficient access to affordable, reliable and safe energy services, and taking into account available reasonable alternative means of realising these capabilities' [7].

This definition is important in justifying our framework because of its ability to capture the well-being implications and injustices CCM

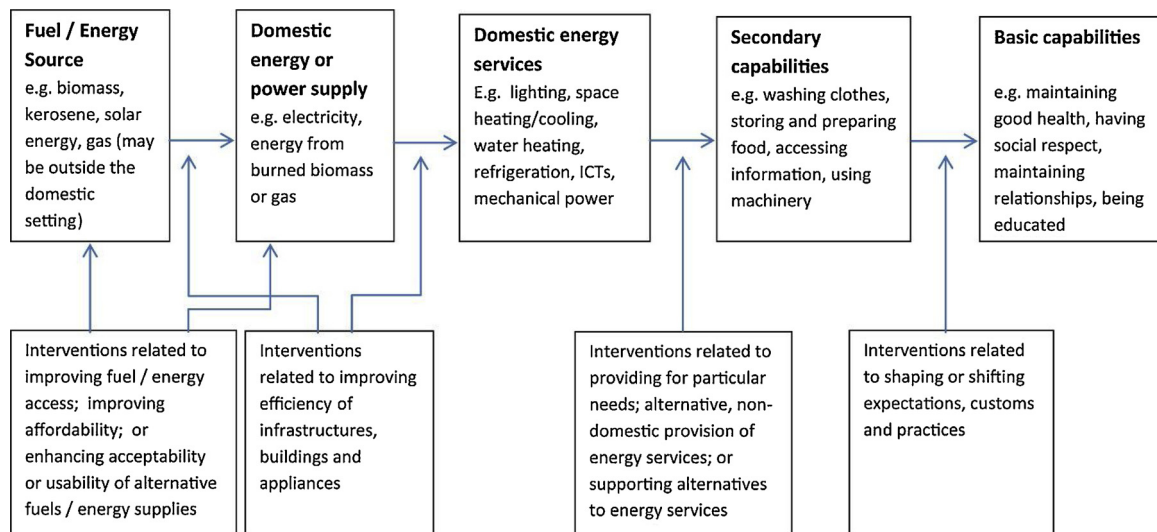


Fig. 2. Day et al. [7] conceptualising the relationship between energy, services and outcomes with interventions in areas which aid in avoiding fuel poverty.

might yield, if it curbs an already vulnerable citizen's access to energy derived from fossil fuels. This approach enables Day et al. [7] to identify where certain causes of energy poverty arise as a result of inadequate access to energy and energy services, and consequently where interventions should occur to minimise them [7]. The framework presented by Day et al. [7] can already be used to illustrate the process of capability derivation through domestic energy services powered by fossil fuelled derived energy, particularly if we omit other energy sources listed within it. Through expansions it may capture various other means of capability derivation that FFDE contribute too.

4.3. Capability from transport

Day et al.'s framework considers only the relationship between direct domestic energy consumption and capabilities derivation. However, transport is another widely used means through which FFDE is utilized to provide a service, for example, accessing healthcare and education, or recreational sites via a car, and therefore is likely to conflict with certain forms of CCM [64]. As with other forms of fuel poverty, inadequate access to transport can have significant consequences to a person's well-being, barring them from accessing important services and sources of well-being [65]. Transport can therefore be seen as means of attaining functioning and capability and it has been suggested that the capabilities approach could yield many lessons for transport planning [66,67]. Simultaneously, transport is responsible for a substantial portion of many nations emissions [38]. Vehicles and fuel have been the subject of proposed and existing emissions reductions policy. A policy which seeks to reduce emissions from transport may inadvertently reduce vulnerable group's access to capability supporting services [68].

Day et al.'s framework does not capture the relationship between fossil fuelled private transport and basic capabilities. Transport is currently a source of capability attainment, but because of its current dependence on FFDE, it is linked to GHG emissions and subsequently climate change. If climate change mitigation, motivated by well-being concerns is introduced to target emissions from transport, motivated by climate-well-being concerns, it also poses the risk of inhibiting well-being derivation from these sources. Incorporating environmental meta-capabilities and capability conflicts within this framework would inherently account for the negative links between FFDE and well-being and help frame the tensions between the well-being implications of climate change and CCM. Being able to capture this relationship is instrumental in outlining the impacts that CCM can inadvertently have on vulnerable groups.

5. Expanding the tension triangle: creating a well-being lens

Here we combine Day et al.'s framework with Holland's capability conflicts and environmental meta-capabilities and extend it to include private transport. Day et al.'s framework is an important first step in conceptualising the process of capability derivation from energy use and they suggest their framework may be expanded beyond its initial scope. We aim to focus solely on energy derived from fossil fuels because of their significant links to climate change. We incorporate transport into the framework to more broadly capture uses of FFDE. We are aware that many of the processes we outline can occur through the use of other energy sources. However, our focus is specifically on fossil fuels as to provide a conceptual snapshot that illustrates the relationships between the processes that make up the tensions triangle. This expansion will later aid in outlining the process through which certain policies might disrupt the flow of capabilities currently derived from fossil fuels.

5.1. Incorporating transport

To encompass emissions from private transport, 'domestic energy or power supply' featured in Day et al. [7] will need to be expanded. Thus, in the model presented below this stage is termed 'private energy and supply' (PES). This allows for the incorporation of refined fossil fuels into this stage of the framework. Refined fossil fuels are often used in private transport and consequently, the next stage in the framework 'domestic energy services' is replaced with 'private energy services' to reflect the private use of FFDE outside a domestic environment. From there, the secondary and basic capabilities derived from energy use can remain unchanged.

The extended framework can now illustrate how we might derive capability through petroleum fuelled private transport. For example, fossil fuels may be initially combusted to provide energy for the refinement and transport of petroleum. This petroleum is then combusted within a private vehicle generating mechanical power, which provides a secondary capability of transit. The ability to transit then yields the opportunity to derive a number of basic capabilities. For example, the capability of affiliation – one might be enabled to physically affiliate with others through the use of private transport. Another example might be enabling access to distant health care facilities and in turn the capability of bodily health might be derived (Fig. 3).

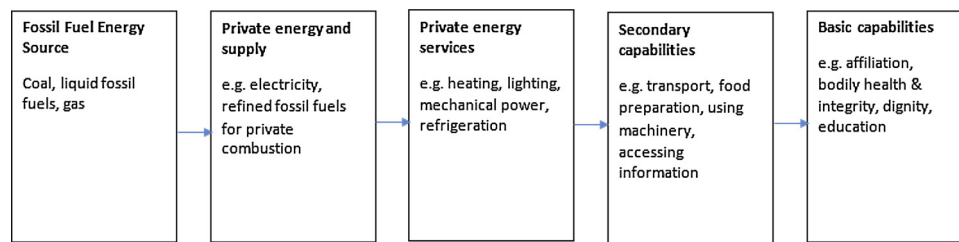


Fig. 3. Capability derivation chain from fossil fuels through private energy use.

5.2. Meta-capacities and capability conflicts

The initial framework (above) illustrates how we arrive at basic capabilities through the combustion of fossil fuels, and thus illustrates the relationship between FFDE use and well-being outlined earlier in the tension triangle. To link this relationship to the well-being impacts of climate change i.e. the well-being motivation of CCM, we draw on Holland's [12] conception of environmental meta-capabilities and capability conflicts. Holland's framing of these two concepts enables us to conceptualise the well-being impacts of climate change within the capabilities space. Additionally, as described, climate change's primary driver is the combustion of fossil fuels. Thus, to extend the model we link sources of emissions to conceptual carbon space consumption. Opschoor [69] define 'carbon space' as:

'...long term maxima for temperature rise or concentrations of greenhouse gases [which] defines spaces within which further emissions of these gases are to remain.'

[69], p. 2)

Or more simply, carbon space is the capacity of the atmosphere to hold a particular concentration of GHGs¹¹ whilst maintaining a particular temperature.

To achieve this extension, we conceptualise an ongoing tension between carbon space consumption and what we term 'homeostatic environmental meta-capabilities'. These are sets of capabilities that could potentially be derived from a less strained environment in which a more sustainable society is embedded. This is essentially the aim of CCM. For example, a climate that is less subject to change because society has avoided further emissions, may yield more stable and predictable weather patterns and less severe weather events, this might in turn aid crop yields which depend on more predictable weather cycles. This could lead to improved food security and avoid famines and hunger, helping to maintain people's capability of bodily health and integrity. However, in our less sustainable reality climate change continues to disrupt the environment and weather patterns, our ability to derive a wider array of capabilities from the environment declines e.g. bodily health and integrity, identity and culture, affiliation etc. This conflict then feeds back negatively to secondary and basic capabilities (represented by the red connections in Fig. 4), illustrating the capability depriving impacts of climate change. Therefore, as we overconsume one particular environmental service –carbon space– we reduce our ability to derive other environmental meta-capabilities. Holland [25] suggests that when such a state of ecological conditions exist which enable minimum levels of capability thresholds to be met that an 'environmental justice threshold' has been met or surpassed.

As we noted earlier our focus here is on the well-being conflicts that occur between FFDE use and CCM. However significant well-being impacts occur at other points within our framework, in particular during extraction and refinement. Healy et al. [13] illustrate these 'hidden injustices' that occur throughout trans-boundary supply chains by introducing the concept of 'embodied energy injustices' linking energy extraction to violence, forcible displacements, pollution and

human rights violations. Environmental meta-capability conflicts might occur elsewhere in the supply chain simultaneously to climate impacts. For example, air quality from fossil fuelled transport is a clear environmental meta-capability conflict, where by one means of deriving capability erodes another [25].

6. Discussion

Marino and Ribot [70] state 'as climate-related crises produce winners and losers, so may discourses and plans made to avert such crises'. Our framework, taken with considerations of recognition issues (such as those presented by Schlosberg [27] and Fraser [62]), illustrates the interplay between fossil fuel derived well-being and well-being depriving climate change, and subsequently conflicts that can arise through mitigation attempts.

Through including a broad range of activities that depend on fossil fuels, we illustrate the heterogeneity of emitting activities from which fossil fuelled societies derive well-being. This enables us to better illustrate the points at which CCM might disrupt a person's current means of well-being attainment from FFDE use. Through illustrating this process in the capabilities space, we are able to outline how capability deprivation resulting from misinformed CCM can compound injustices that were overlooked during its formulation. When referring to Schlosberg's [27] inclusion of Fraser's [62] recognition concerns in a broad capabilities approach, it becomes apparent as to how these injustices result. Having a full set of capabilities is paramount to being able to participate within the democratic processes and thus achieve 'democratic equality', which in itself integrates equal recognition. In recognising this, we can see how the impairment of someone's capability derivation from FFDE might prevent them from participating in deliberative procedures in which they might attain some sort of recognition and the eventual amelioration of their well-being deprivation [55].¹²

The interplay between capabilities, the attainment of recognition (or lack thereof), and CCM becomes further ostensible when we consider how misguided CCM can compound these injustices. Because of their existing capability deprivation and misrecognition, vulnerable groups may find it difficult to participate in policy formulation and other democratic process, even through simple processes of transiting to areas in which these processes occur. This can lead to the formulation of policies which fail to take account of these groups' concerns, and therefore may be more likely to disproportionately impact these groups than other groups who have a greater capability to be politically active.

As such a process unfolds in which vulnerable groups become further marginalised as they are continually distanced from societal participation. This aligns in particular with Schlosberg's [27] view that vulnerable group's statuses are at least, in part, 'socially, politically, and economically constructed' and that it is therefore necessary for them to attain some form of control over their political environment in order to ameliorate their position. For example, within the UK 11% of households are in fuel poverty, in this position members of a household may

¹¹ When GHGs are discussed as carbon dioxide equivalents.

¹² Capabilities of participation and control over ones political environment can be likened to theories of social power.

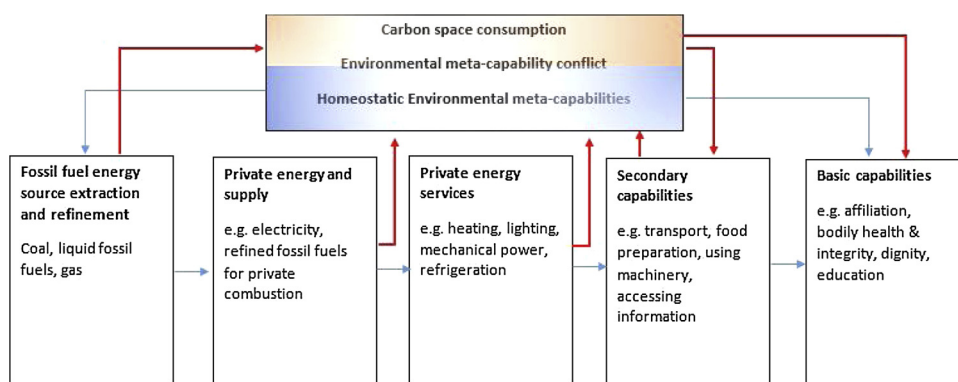


Fig. 4. Combined framework of capability derivation from fossil fuels and capability conflicts between carbon space consumption and environmental meta-capabilities. Blue arrows indicate the flow of energy, services and well-being from energy use and the environment to capability attainment. Red arrows represent the conflicts that result from emitting activities at the stages of fossil fuel extraction and refinement, private energy services, secondary capabilities such as combusting fuel in a car to achieve transit, and the subsequent deprivation of secondary and basic capabilities that result from the collective environmental impacts that reduce our ability to derive capability from the environment.

be struggling to heat their homes and subsequently may develop health issues, thus reducing their capability of bodily health [71]. These health issues may inhibit a person's capability to engage in society and to exercise political control within their environment, for example, the ability attending public consultations and even visiting polling stations [72]. Thus through facing existing capability deprivation, members of these household may find it difficult to engage in a discourse which could either alleviate or exacerbate their position – Schlosberg [27] terms this 'corrosive disadvantage'. In the case of climate mitigation, a policy implemented which increases the cost of household energy bills, thus further exacerbating their capability deprivation.

Illustrating that CCM discourse can be analysed through a well-being lens is pertinent to providing a framing climate change mitigation in reference to it's well-being impacts, both positive and negative. If our motivation to mitigate climate change is found in climate change's detrimental impact on human well-being, then our concern should be extended to those vulnerable groups whose well-being is risked as a result of misguided climate mitigation.

We noted earlier that '*at a certain point increasing energy consumption does not appear to contribute to gains in well-being* [73]. Therefore a focus on other maintaining and attaining other means of well-being may help partially decouple the energy-well-being relationship, and could provide avenues to maintain well-being whilst mitigating climate change [52].' Our framework outlines the current means and capabilities we depend on to attain well-being. However, these capabilities need not be tied to fossil fuels permanently. Many of these capabilities could instead be ensured by more inclusive solutions, for example, improvements in accessible public infrastructure, such as replacing roads with trams and bus lanes, utilising industrial heat through combined heat and power plants, mandating energy efficiency measures in new homes and subsidising retrofits in inclusive and equitable ways. An awareness of the potential well-being conflicts CCM could cause is paramount in guiding the formation of well-being enhancing responses to climate change. Viewing these CCM and FFDE use in relation to well-being as done through the tensions triangle will help avoid the separation of these issues.

7. Conclusion

We have argued that in order to minimise well-being impacts of climate change mitigation we must view both climate change mitigation and FFDE use through a well-being lens. To effectively do so requires a robust and holistic conception of well-being capable of capturing the complex relationships between these conflicting processes. We have argued that the capabilities conception of well-being provides this and that viewing these relationships in terms of capabilities allows us to assess and shape current and future mitigation strategies that consider vulnerable groups to minimise and ameliorate potential well-being conflicts.

Declarations of interest

None.

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