Chapter 4

Ethical framework

Chapter 4 – Ethical framework

Box 4.1: Overview

A number of overlapping moral values form the basis of an ethical framework that can inform society's approach towards biofuels. These are: rights and global justice; solidarity and the common good; and stewardship, sustainability and intergenerational equity.

From these values we derive six Ethical Principles which can be used to evaluate biofuels development and guide policy making. These Principles are as follows:

i. Biofuels development should not be at the expense of people's essential rights (including access to sufficient food and water, health rights, work rights and land entitlements).

ii. Biofuels should be environmentally sustainable.

iii. Biofuels should contribute to a net reduction of total greenhouse gas emissions and not exacerbate global climate change.

iv. Biofuels should develop in accordance with trade principles that are fair and recognise the rights of people to just reward (including labour rights and intellectual property rights).

v. Costs and benefits of biofuels should be distributed in an equitable way.

We then consider whether there may in some cases be a duty to develop biofuels. To address this we propose a sixth Principle:

vi. If the first five Principles are respected and if biofuels can play a crucial role in mitigating dangerous climate change then, depending on additional key considerations, there is a duty to develop such biofuels.

These additional key considerations are: absolute cost; alternative energy sources; opportunity costs; the existing degree of uncertainty; irreversibility; degree of participation; and the overarching notion of proportionate governance.

We believe that these Ethical Principles should guide any policy making in the field of biofuels – and indeed, they should be applied to comparable other technologies. As for their application, we urge policy makers and other stakeholders to use the Ethical Principles as a benchmark when evaluating technology and policy development and to make sure that serious consideration has been given to relevant aspects before proceeding. Any such decisions will be difficult under given circumstances of uncertainty, and should be made in a procedurally fair way – one that is transparent and includes all relevant stakeholders. There are also considerations of feasibility. A comprehensive ethical appraisal of biofuels technologies and policies needs to consider the ethical framework in the light of what is practical.

Introduction

4.1 The science of new biofuels is still emerging and, while there has been some debate about the harmful consequences of current biofuels production, there has been little systematic ethical inquiry. This applies in particular to the new approaches.[363] Scientists and ethicists alike are still exploring possibilities in an area fraught with unknown, or at least uncertain, variables.

4.2 Establishing a robust ethical framework for critical discussion is especially important when trying to assess the merits of new approaches to biofuels and their potential impact on the ethical problems of earlier developments. It is also important to establish whether these pathways are technically, commercially and indeed politically feasible. However, such a framework is also necessary to evaluate current and established biofuels production, which will continue to exist for the foreseeable future (see Chapter 1).

[363] An exception is: UNESCO (2009) *The ethics of adoption and development of algae-based biofuels*, available at: http://www.unescobkk.org/fileadmin/user_upload/shs/Energyethics/ECCAPWG9Algaev2.pdf.

4.3 Current biofuels (most of which belong to the so-called first generation) give rise to a number of social and ethical concerns (discussed in Chapter 2), and the new approaches to biofuels development and production (which are the subject of Chapter 3) are also likely to be controversial. In view of the multi-faceted issues associated with biofuels production, and given the extent of reasonable disagreement in modern liberal democratic societies, we sought to outline principles that might enjoy what John Rawls terms "an overlapping consensus", i.e. a consensus on a set of values, concepts and principles, even if there is disagreement on the best justification of those values and principles. People can agree on what should be done even though they do so for different reasons, each appealing to their own basic ethical values.[364] In considering current and new biofuels, which play across an international stage, a broad overlapping consensus is particularly important to encompass the many global actors involved.

4.4 This chapter proposes a number of moral values for considering both current and new biofuels. Justice- and human rights-based frameworks are invoked, alongside values drawn from social ethics, including stewardship, solidarity and the common good.[365] The values that we consider here contain elements that can overlap, and they can, in certain circumstances, have different implications. We will look therefore for practical principles which can be applied clearly in each case, and which we have drawn from one or several of the values. This report thereby offers an ethical framework which, rather than endorsing a particular course of action or technology pathway, can be used to help others to come to decisions about which path to pursue, and which can be employed to ask the right questions during this decision-making process.

4.5 When deliberating about which path to take, there may be cases where biofuels meet the Ethical Principles but in which there are difficult trade-offs. There may also be reasonable disagreements, for example about whether some benefits generated are worth the costs incurred. Where there are such difficult choices, and reasonable disagreements, it is important that the decision whether to invest in biofuels honours principles of 'procedural justice'. Procedural justice can be contrasted with distributive justice. Whereas distributive justice, as captured in Principle 5, is concerned with the fair distribution of burdens and benefits, procedural justice is concerned not with what distribution of burdens and benefits is chosen but with the process by which the political decisions are made and who makes the decision (i.e. who is included in the decision-making process). Procedural justice requires that, where people's fundamental interests are profoundly and involuntarily shaped by a political decision, those whose key interests are affected in this way are entitled – as a matter of procedural justice – to have an input into the decision-making process.[366] At the very least, the responsible use of political power requires taking into account the interests and well-being of those affected, even if those affected do not have formal standing in the decision process. A consultative process that includes companies and affected populations in developing countries could help to elucidate those interests. Or, in the UK context, the process might involve consultation with local communities affected by the situating of a new biofuels plant.

4.6 Finally, as well as considering biofuels against the alternative uses for land, they must be considered against the full range of alternative energy technologies, not just fossil fuels. While it is not the aim in this report to undertake such an extensive assessment of all energy technologies compared against each other, we believe that the ethical framework laid out in this chapter can be applied to all other technologies, and we urge policy makers to do so. This is taken up briefly in Chapter 6.

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[364] Rawls J (1993) *Political liberalism* (New York: Columbia University Press), Lecture IV.
[365] Others might also refer to welfare-based frameworks, which we do not consider in any detail here.
[366] Goodin RE (2008) *Innovating democracy: democratic theory and practice after the deliberative turn* (Oxford: Oxford University Press), chapter 7; Pogge T (2008) *World poverty and human rights: cosmopolitan responsibilities and reforms*, 2nd Edition (Cambridge: Polity Press), p190; Held D (2004) *Global covenant: the social democratic alternative to the Washington Consensus* (Cambridge: Polity Press), p100.

Moral values

4.7 The case studies in Chapter 2 highlight the complex nature of the issues raised by biofuels production, including the international impact of biofuels production and the uncertainty surrounding their attendant benefits and burdens. To address this complexity, the ethical framework developed in this chapter starts by identifying some relevant moral values. These provide the framework and moral vocabulary from which we develop six Principles. They are key moral values which are both commonly shared and of relevance to present and future biofuels. In selecting them, we are keen to highlight that they have areas of confluence addressing what we believe are the most important ethical challenges in this area. Together and through this confluence, they constitute a moral framework that enables us to construct strong Ethical Principles which should enjoy widespread support.

Human rights

4.8 When considering the moral standards against which to test biofuels, some will appeal to a set of human rights, derived from the dignity and moral status of human beings. These are, for example, reflected in the Universal Declaration of Human Rights (UDHR)[367] and in the European Convention on Human Rights.[368] There are a number of different considerations which provide support for human rights. First, there are powerful 'deontological' or principled arguments for human rights. These appeal to the Kantian ideal that people should treat all others with respect and never merely as means to an end, and they argue that a morality of human rights is needed to show proper respect for people's moral status and dignity.[369] In addition to this, there are also powerful 'teleological' or consequential arguments for human rights. These focus on the way that rights protect vital interests. From a teleological perspective, human rights provide the necessary basis for each person to attain a decent standard of living.[370]

4.9 We take international human rights as establishing a moral minimum below which the treatment of people should not fall.[371] This holds particularly for those human rights which are essential conditions for at least a decent opportunity for human flourishing. These can be seen as "negative rights",[372] which oblige others to refrain from acting in ways that arbitrarily threaten their life, impose serious threats to their health and well-being, or undermine their ability to subsist.[373] Human rights thus lead to constraints[374] which may not be crossed and which apply universally. This is particularly relevant to Principle 1 as described below at paragraph 4.27ff. (For some authors, human rights entail both negative duties to refrain from harming others and positive duties to protect others from human rights violations.[375] We affirm positive rights but in relation to biofuels (especially in Principle 1), our analysis depends primarily on the importance of negative duties not to violate the rights of others.)

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[367] Universal Declaration of Human Rights of 1948.
[368] European Convention on Human Rights of 1966. The European Convention on Human Rights sets out a number of rights, for example those to: freedom from slavery; life and liberty; protection of property; privacy; and freedom from discrimination. UDHR also includes the right to work and to health (including access to food).
[369] Kamm FM(2007) *Intricate ethics: rights, responsibilities and permissible harm* (Oxford : Oxford University Press); Nagel T (1995) Personal rights and public space *Philosophy and Public Affairs* **24:** 83–107.
[370] Buchanan A (2004) *Justice, legitimacy, and self-determination: moral foundations for international law* (Oxford: Oxford University Press), p127; Caney S (2005) *Justice beyond borders: a global political theory* (Oxford: Oxford University Press), chapter 3.
[371] Shue H (1996) *Basic rights: subsistence, affluence and US foreign policy*, 2nd Edition (Princeton: Princeton University Press).
[372] In political philosophy, positive rights are often defined as those rights which permit or oblige action, whereas negative rights are those which permit or oblige inaction. Likewise, the notion of positive and negative rights may be applied to either liberty rights or claim rights, either permitting one to act or refrain from acting, or obliging others to act or refrain from acting; see: Hohfeld WN (1919) *Fundamental legal conceptions, as applied in judicial reasoning and other legal essays* (New Haven: Yale University Press).
[373] Pogge T (2008) *World poverty and human rights: cosmopolitan responsibilities and reforms*, 2nd Edition (Cambridge: Polity).
[374] The term "side constraint" has been coined by Robert Nozick; see: Nozick R (1974) *Anarchy, state and utopia* (New York: Basic Books), p29. Nozick asserts that the side-constraint view forbids the violation of moral constraints in the pursuit of a goal.
[375] Shue H (1996) *Basic rights: subsistence, affluence and US foreign policy*, 2nd Edition (Princeton: Princeton University Press), chapter 2.

4.10 Few human rights are, however, absolute in the sense that interference with them is never permissible. Indeed, it is not unusual for human rights to give rise to potential conflict. Compare, for example, Article 27(2) of the UDHR, which states that: "Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author",[376] with Article 27(1): "Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits."[377] How can both rights be given equal effect? This is certainly a challenge but it does not follow that tension is inevitable or that rights are irreconcilable.[378] Rather, some rights – such as intellectual property rights – might be seen as conditional on contributing to the common good, while in other cases a human rights approach makes it incumbent on states to ensure that the exercise of rights is consistent with giving effect to other fundamental rights.[379]

4.11 Human rights are universally enjoyed by *all* human beings, no matter the state or nation to which they belong. Thus, they can be seen as capturing one universal, albeit minimal, element of the concept of global justice. They transcend state borders and must be respected equally everywhere in the world.[380] Biofuels clearly have international implications in that many companies developing them will be using land, water and labour in one country (and not necessarily their own country) that will produce fuel to be used elsewhere. At a minimum, states have a duty to respect human rights, requiring that they design regulatory frameworks to ensure that the development of biofuels does not violate human rights, giving equal weight to the human rights of citizens and non-citizens. Where tensions arise, the duty on states is to give maximum effect to the range of rights at issue, taking into account the nature and extent of the impact on people's rights and lives. No claim should disproportionately affect the human rights of another.

4.12 It can be argued, therefore, that biofuels production breaches basic human rights when it endangers local food security or displaces local populations from the land they depend on for their daily subsistence. Similarly, biofuels production may become a human rights issue when it threatens our environmental security (see Box 4.2) through the destruction or degradation of ecosystems and natural resources which are critical to the health and subsistence of people.[381]

Box 4.2: Human rights and environmental security

The many linkages between human rights and protection of the environment have long been recognised. The 1972 United Nations (UN) Conference on the Human Environment declared that "man's environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights – even the right to life itself." Some of these linkages were elaborated in the 27 principles delivered in the Rio Declaration on Environment and Development that emerged from the 1992 UN Conference on Environment and Development (the 'Earth Summit') and were further considered in the 2002 report to the 58th session of the Commission on Human Rights on a joint Office of the High Commissioner for Human Rights and UN Environment Programme seminar on human rights and the environment. There is now an emerging consensus that human rights are infringed where development actions pollute water, the land or the air, or degrade ecosystems and natural resources which are important to sustain the health and well-being of people. Human rights to life, food, water and health have environmental preconditions that must not be compromised.

4.13 It should be noted that, in keeping with the idea of overlapping consensus, invoking human rights to support our Ethical Principles does not mean that we adopt an exclusively human rights-based approach to the evaluation of biofuels technology, or, as some have done, to the

[376] Universal Declaration of Human Rights of 1948, art 27.
[377] Ibid.
[378] Brown A (2005) Socially responsible intellectual property: a solution? *SCRIPTed* **2**: 485–513.
[379] Helfer LR (2003) Human rights and intellectual property: conflict or coexistence? *Minnesota Intellectual Property Review* **5:** 47–61.
[380] Note that they are only one aspect of global justice, but they are an important aspect.
[381] See in this context the discussion of environmental rights in: Hayward T (2005) *Constitutional environmental rights* (Oxford: Oxford University Press), chapter 2; Nickel J (1993) The human right to a safe environment: philosophical perspectives on its scope and justification *Yale Journal of International Law* **18:** 281–95.

whole field of bioethics.[382] Mainly through their legal dimension, human rights serve very well to specify some minimum moral conditions which must be met and which are set out under Principle 1, and inform Principle 2. Indeed, the legal framework offers means and tools for dealing with potential conflicts with human rights conditions.[383] However, in many cases, these conditions are also supported by other moral values. To us, such confluence serves as a particularly strong justification for a principle.

Solidarity and the common good

4.14 Biofuels production is driven by the expectation that it may contribute to ensuring energy security, mitigating climate change and supporting economic development (see Chapter 1). The concept of human rights helps us to understand how trying to achieve these benefits might harm people in unacceptable ways. Subscribing to the idea of human rights includes obligations to protect them beyond national borders. However, human rights are only one of several approaches that seek to protect individuals, particularly those who are vulnerable, or address issues of fairness. Others might be framed in terms of one's own moral duty, or in terms of more extensive duties and responsibilities *owed* to every person in modern societies that go beyond global protection of minimum human rights.[384] These, which we focus on in this section, appeal to other moral values, such as solidarity. Values such as solidarity focus more on the importance of protecting individuals as members of groups or populations. Solidarity often leads to similar prescriptions to those that flow from a commitment to rights, but it differs importantly in that it seeks to go beyond a language of 'entitlements' and emphasises a shared commitment to the good of all. Recent Nuffield Council reports have argued that more positive duties which flow from such moral values have an important, but sometimes overlooked, contribution to make to public discussion, policy and decision making.

4.15 In particular, the Council's 2009 report *Dementia* incorporated the value of solidarity, describing it as the idea that we are all 'fellow travellers' and that we have duties to support and help each other and in particular those who cannot readily support themselves.[385] A central meaning of solidarity is that individuals or groups are not left to fend for themselves in times of difficulty. The Council's 2010 report *Medical profiling and online medicine* also invoked the "intrinsic social solidarity of a national health service", whereby the consequences of health risks are shared, and the vulnerable protected, for example through provision of a certain minimum of care.[386] In the context of biofuels, the value of solidarity directs ethical attention to the most vulnerable people within societies, reminding us that we have a 'shared humanity', a 'shared life' and that those who are most vulnerable should be given special attention. For biofuels development, the value of solidarity thus requires countries or companies to ensure just reward, that benefits are shared fairly and that burdens are not laid upon the most vulnerable in society (see Principles 4 and 5). If a particular form of biofuel could only be developed at (say) the expense of vulnerable people in developing countries then, however much it might contribute to energy needs in other countries, it should not be developed. Like human rights, solidarity thus also underpins the development of moral limits to the implementation of biofuels.

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[382] See the discussion in: Ashcroft R (2008) The troubled relationship between bioethics and human rights, in *Law and Bioethics*, Freeman M (Editor) (Oxford: Oxford University Press), pp31–51.

[383] For example, through the concept of proportionality in giving effect to rights or interests which are in conflict with each other.

[384] For a discussion of ideals of global justice that go beyond human rights, see: Caney S (2005) *Justice beyond borders: a global political theory* (Oxford: Oxford University Press), chapter 4.

[385] Nuffield Council on Bioethics (2009) *Dementia: ethical issues, available at*: http://www.nuffieldbioethics.org/sites/default/files/Nuffield%20Dementia%20report%20Oct%2009.pdf. This report suggested that the high prevalence of dementia, and the fact that we all face a significant risk of developing dementia as we get older, might enable us to develop a particular sense of solidarity with each other in the context of dementia and dementia care.

[386] Nuffield Council on Bioethics (2010) *Medical profiling and online medicine: the ethics of 'personalised healthcare' in a consumer age*, available at: http://www.nuffieldbioethics.org/sites/default/files/Medical%20profiling%20and%20online%20medicine%20-%20the%20ethics%20of%20%27personalised%20healthcare%27%20in%20a%20consumer%20age%20%28Web%20version%20-%20reduced%29.pdf, p53.

4.16 Solidarity is taken here to govern the relationships and obligations between populations.[387] This wide interpretation of the value has some overlap with the value of the common good[388] which goes back at least to Aristotle. He argued that a good life is oriented to goods shared with others, the common good of the larger society of which one is a part. For him, individual goods and the common good are linked, but the latter is more important.[389]

4.17 Climate change, as a challenge with global causes, effects and implications, suggests that the value of the common good as outlined in Box 4.3 is important. It is widely recognised across societies and cultures that greenhouse gas (GHG) emissions from industry and from land and forest degradation are having dangerously negative effects on the environment. If there is an emerging worldwide consensus on this then it might be possible to get agreement on minimum common social goods, encompassing food security, energy security and environmental security. These factors, along with the ecosystem services[390] that support human well-being can be seen as the minimum common social goods necessary for human life and flourishing. The value of the common good encourages both scientists and politicians to strive for effective measures, which might include biofuels, to protect these assets across societies and generations. This provides another justification for several of the Ethical Principles discussed below (in particular, Principles 2 and 3). A common good perspective also underlines the urgency of the debate about biofuels. Although there are justifiable criticisms of some of the consequences of biofuels and fears about the possible consequences of new ones, the status quo involving ever-increasing use of fossil fuels also does not accord with a common good perspective. Doing nothing amounts to doing something extremely damaging and finding other ways of securing essential energy needs might be required to realise the common good. This is reflected in our Principle 6.

Box 4.3: Features of the common good

Justifications for the value of the common good include those listed below.

- Some global issues raise ethical concerns that are not addressed adequately using individualistic ethical concepts where, for example, climate change or world peace may have a low priority compared with individual concerns and interests.
- Common good arguments require us to identify goods that we believe all, including future generations, should share equitably, whatever society they live in.
- Common good arguments thus usually assume that there is common entitlement to essential resources.
- Common good arguments might require current generations to reduce their demands for the sake of future generations. For developed countries this could mean restrictions on lifestyle; for developing countries, this could mean reducing their expectation of achieving the same lifestyle currently prevalent in developed countries.

Common good arguments do not, therefore, depend on simply balancing the interests of those living now but, as with solidarity arguments, they explicitly evoke altruism, especially among the most privileged.

[387] Solidarity can also be interpreted in narrower senses, such as solidarity between particular groups sharing certain common goals.

[388] The concept of the 'common good' should not be confused with the concept of the 'public good' as that term is conventionally employed in economic analysis. A 'public good' is normally defined in terms of two characteristics. First, one person's use of a public good does not reduce the amount available for others. Second, it is not possible to exclude anyone's consumption of it, save for prohibitive costs: i.e. one cannot supply it to some but not others; see: Begg D, Fischer S and Dornbusch R (2003) *Economics*, 7th Edition (Maidenhead: McGraw-Hill Education), p232. A standard example of a public good is military defence.

[389] "…though it is worthwhile to attain the end [i.e. human good] merely for one man, it is finer and more godlike to attain it for a nation or for city-states." Aristotle *The Nicomachean Ethics* (Oxford: Oxford University Press), 1094b, p4.

[390] Humankind benefits from a multitude of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as ecosystem services and include products such as clean drinking water and processes such as the decomposition of wastes.

Sustainability, stewardship and intergenerational justice

4.18 Stewardship and sustainability generate obligations to those elements of the natural world that are not of immediate material benefit to people, particularly where the interests of future generations are involved. Sustainability implies the requirement to sustain some entity or value over time. Considering what it is that should be sustained, our focus here is primarily on environmental sustainability, calling for "the sustaining into the future of some aspect of the natural environment".[391] Protection of the natural world and environmental security are vital for human life, which depends on the preservation of many benefits (ecosystem services) provided by the environment.[392] It should be noted that 'environmental sustainability' and 'environmental security' can be interpreted in many ways.[393] Some take an approach which values environmental sustainability only because and to the extent that it benefits human beings (anthropocentric approach). This perspective allows trade-offs between sustainability and other human interests, for example energy security. Others take the less anthropocentric view that sustainability needs to be protected even if human interests are not involved, for example because they regard biodiversity as an intrinsic value (i.e. a value of itself).[394] We acknowledge these perspectives but believe that it is not necessary to take one of these views in order to agree on a moderate point of view which demands adherence to sustainability standards and protecting environmental security while at the same time allowing the possibility of some trade-offs between sustainability and other goals.

4.19 A second key issue inherent in the value of sustainability is a commitment to intergenerational justice and the obligations of each generation to those that follow them. A sustainable approach to biofuels development thus requires that we do not deplete the world's natural resources without regard to the legitimate interests of future generations. The concept of environmental sustainability thus leads to the idea of stewardship. Sustainability requires us to act as stewards of the natural world, with legitimate rights to use it but also with obligations to leave it in a fit state for future generations. There is thus some overlap with claims that humans – including future generations – have rights to environmental sustainability and security, and with the obligation to protect the common good.

4.20 The Nuffield Council's 2007 report *Public health: ethical issues*[395] used the concept of stewardship to argue that an important function of government is to ensure conditions that make it easy (or easier) for people to be healthy – which might entail imposing obligations or penalties on industries where self-regulation has proven ineffective.[396] We also adopt this perspective here. In the context of this report, we take stewardship to mean that governments and other stakeholders have an obligation to ensure that the natural world and its resources are sufficiently protected, both for current and for future generations. Standards of sustainability are a way to make sure such stewardship is exercised properly, because they aim to protect important ecosystem resources. We therefore conclude that stewardship can be seen as embodying the obligation to ensure that sustainability standards are adhered to.

4.21 In addition to our stewardship responsibilities in the present, we need to ask what obligations current generations owe to future generations with respect to any beneficial or harmful effects of biofuels. The World Commission on Environment and Development (also known as the

[391] Dobson A (1998) *Justice and the environment: conceptions of environmental sustainability and theories of distributive justice* (Oxford: Oxford University Press), p41.
[392] Millennium Ecosystem Assessment (2005) *Ecosystems and human well-being: synthesis*, available at: http://www.maweb.org/documents/document.356.aspx.pdf.
[393] See the long-standing disputes between what has been called 'strong' and 'weak' sustainability: Neumayer E (2003) *Weak versus strong sustainability: exploring the limits of two opposing paradigms*, 2nd Edition (Cheltenham: Edward Elgar); Beckerman W and Pasek J (2001) *Justice, posterity, and the environment* (Oxford: Oxford University Press), pp74–7.
[394] In the latter case, a different conception of sustainability – i.e. that values biodiversity as a value of itself – is at stake.
[395] Nuffield Council on Bioethics (2007) *Public health: ethical issues*, available at: http://www.nuffieldbioethics.org/sites/default/files/Public%20health%20-%20ethical%20issues.pdf.
[396] This report argued that in areas where the state has direct regulatory power, such as implementing clean air acts, or ensuring access to unpolluted air or drinking water, or enforcing adequate working conditions, the state must recognise its stewardship responsibility.

Brundtland Commission) argued that current generations should satisfy contemporary needs but must do so in a way that does not undermine the ability of future generations to satisfy their core needs: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[397] However, this would allow us in principle to consume resources and have enjoyable lives so long as future generations have enough to cover their most basic needs. This would be contrary to the values of stewardship and the common good. Regarding this particular point, we therefore go beyond the Brundtland view and hold that current generations should also ensure that they treat their successors in the same way that they would want to be treated by preceding generations. We are thus advocating a position that is closer to 'strong' than 'weak' sustainability.[398] It would be wrong, on this account, to leave future generations with a world that we would think unjust if we inherited it from our forebears.[399] The point derived from this is that the development of biofuels cannot be adequately addressed without taking into account the legitimate claims of future generations to receive from their predecessors a world which is liveable, to enjoy certain benefits and also not to be exposed to certain harms (see Principle 2).

A note on precautionary approaches

4.22 Risks and benefits of biofuels are often discussed in terms of 'the precautionary principle' or 'a precautionary approach',[400] and in earlier Nuffield Council reports we have used the same language.[401] The idea of carefully evaluating risks and benefits case-by-case and taking account of the relative costs of consequences flowing from particular developments[402] – which could be described as a comparative or moderate version of the precautionary approach – underlies the current report. However, we do not subscribe to any particular version of the precautionary approach; in fact, the use of the term precaution is not necessarily helpful in our context, as it is often either vague or overly restrictive. We believe that, instead of trying to develop an appropriate version of the precautionary approach suited to the biofuels context, our framework for an ethical evaluation of biofuels could be more useful.

4.23 This framework goes considerably beyond any blanket approach to precaution. We suggest that the firm Ethical Principles we develop in the following sections give far more direction to policy makers and other stakeholders regarding what to do in situations of *ex ante* uncertainty than would many of the precautionary approaches alone. Whereas some precautionary approaches do little beyond stressing the need for careful analysis of the attendant risks and benefits – which we certainly endorse – the Principles provide concrete guidance about standards to be supported and actions to be avoided. In sum, the Ethical Principles which follow replace the formal and therefore unspecific criteria of many precautionary approaches with substantive and

[397] World Commission on Environment and Development (1987) *Our common future: towards sustainable development*, available at: http://www.un-documents.net/ocf-02.htm, Part 1, chapter 2,

[398] Those who endorse strong sustainability take the view that natural capital – i.e. the range of functions the natural environment provides for humans and for itself – should be afforded special protection. Weak sustainability means that natural capital is seen as capital that can be substituted by other forms of capital, especially produced capital.

[399] See: Caney S (2010) Human rights and global climate change, in *Cosmopolitanism in context: perspectives from international law and political theory*, Pierik R, Werner W (Editors) (Cambridge: Cambridge University Press), pp43–4; Rawls J (1993) *Political liberalism* (New York: Columbia University Press), p274.

[400] For instructive discussions of different interpretations of the precautionary principle, see for example: Weiner JB (2007) Precaution, in *The Oxford handbook of international environmental law*, Bodansky D, Brunnée J, Hey E (Editors) (Oxford: Oxford University Press), pp597–612; Gardiner S (2006) A core precautionary principle *Journal of Political Philosophy* **14**: 33–60; Manson N (2002) Formulating the precautionary principle *Environmental Ethics* **24**: 263–74.

[401] See: Nuffield Council on Bioethics (2004) *The use of genetically modified crops in developing countries: a follow-up Discussion Paper*, available at: http://www.nuffieldbioethics.org/sites/default/files/GM%20Crops%20Discussion%20Paper%202004.pdf; Nuffield Council on Bioethics (1999) *Genetically modified crops: the ethical and social issues*, available at: http://www.nuffieldbioethics.org/sites/default/files/GM%20crops%20-%20full%20report.pdf. See also: Tait J (2008) Risk governance of genetically modified crops: European and American perspectives, in *Global risk governance: concept and practice using the IRGC framework*, Renn O, Walker K (Editors) (Dordrecht: Springer), pp133–53.

[402] Lewens T (2008) Taking sensible precautions *Lancet* **371**: 1992–3.

firm guidance on which lines not to cross. In this way, they are consonant with some recent, well-developed precautionary approaches.[403]

Ethical biofuels: six Principles

4.24 A common theme emerges from the discussion of the moral values as laid out above: they all emphasise that there are certain moral 'red lines' which should not be crossed by biofuels production. To apply this to biofuels production, we have developed six practical Principles. The first five Principles can be used for the practical implementation of biofuels development, while the sixth provides a guideline for future developments.

4.25 It should be noted that the Ethical Principles are presented in this chapter in a strong and aspirational way, as an *ethical ideal*. We urge policy makers to use them in order to make sure that all important ethical considerations have been given their due in the decision-making process. We are aware that there might be cases in which trying to satisfy one Principle might compromise one or more other Principles. For example, furthering equitable development through promoting biofuels on a local scale in developing countries (Principle 5) could potentially come into conflict with the need to protect the environment (Principle 2), because such local production might encroach on land with high biodiversity. In such cases, it is essential that appropriate policies and regulations are developed in order to ensure that a particular technology which might have been developed specifically to avoid violating a particular Ethical Principle does not come at the cost of compromising other ones. Moreover, decision makers need to ensure that requirements of procedural justice are adhered to, i.e. that relevant stakeholders are included in the decision-making process and that decisions are made in a transparent and accountable fashion and are based on reasons which are deemed to be rational and acceptable by all parties involved.[404] In Chapters 5 and 6 we come back to this, make recommendations for the improvement of current policy, and suggest an approach to future policy which enables all Principles to be adhered to.

4.26 **We recommend that policy makers and other stakeholders use the Ethical Principles as a benchmark when evaluating biofuels technology and policy development and always make sure that serious consideration has been given to relevant aspects before proceeding.**

Principle 1: Human rights

Biofuels development should not be at the expense of people's essential rights (including access to sufficient food and water, health rights, work rights and land entitlements)

4.27 Access to a reasonable standard of living, with sufficient nutritious food and enough fresh drinking water, is widely recognised as one of the basic human rights.[405] Based on the values of solidarity and the common good, it follows that there is a particular obligation to ensure access to sufficient nutrition for vulnerable populations, in particular those in developing countries. Even if biofuels production does not contribute to food shortages in the countries where it is used, some steps in the production process may take place in developing countries and may endanger food security there, for example by replacing food crops that would have otherwise been consumed by a local population. Water pollution can occur in biofuels production and some may also need large quantities of water. In order not to violate basic human rights, and in accordance with the requirements of protecting the vulnerable, biofuels production steps should

[403] See, for example, accounts developed by Andrew Stirling, Stephen John or Per Sandin.
[404] These are principles that most accounts of procedural justice subscribe to; see, for example, the discussion in: Cohen J (2009) *Philosophy, politics, democracy: selected essays* (Cambridge, Massachusetts: Harvard University Press).
[405] Universal Declaration of Human Rights of 1948, art 25.

be carefully evaluated for existing or potential future impacts on food security, access to water and water quality.[406] The same holds for the import of biofuels.

4.28 A similar argument can be made regarding people's health, which is essential to an adequate standard of living. This has been recognised as an important human right and can also be endorsed from the perspective of a common good. Solidarity again encourages particular attention to vulnerable populations. It follows that biofuels production should not negatively affect people's health, either through unacceptable working conditions (including inappropriately long hours, or dangerous or unsafe/unhealthy working conditions) in agriculture or processing facilities, or by polluting local land, air and water.

4.29 Finally, both respecting land entitlements and protecting against arbitrary, forceful removal from land[407] – even where a formal deed of title does not exist – have been recognised as a basic human right, and involuntary removal from land when a land title exists is an infringement of this right. Nor is it acceptable to buy land from people who lack proper information about the value of their land.[408] This is relevant to biofuels production, which is expected to take place increasingly in developing countries. A right to access to land for subsistence can be defended from a variety of different viewpoints. Both solidarity and a human rights perspective justify safeguards against populations losing the land they have lived on without adequate compensation. People have strong economic, cultural and historic ties to their land and these must be respected through just cooperation between energy companies and legitimate land holders. It is therefore wrong for members of other countries to deal with anyone other than the legitimate owners of the land and the natural resource employed in the production of biofuels.[409]

Principle 2: Environmental sustainability

Biofuels should be environmentally sustainable

4.30 We have established that there is a case for the sustainable use of natural resources, and that countries have an obligation to act as stewards in order to make sure that minimum sustainability standards are adhered to. Moreover, current generations have a responsibility to ensure that their successors have access to resources for a sufficient standard of living. This means that future generations should inherit a world with enough food and water and clean air as well as intact important ecosystem services. It follows that biofuels production should adhere to sustainability criteria governing the careful use of water, land, and other natural resources. Biofuels should not compromise environmental sustainability, cause further declines amongst the world's biodiversity and threatened species, or further degrade important natural ecosystems, such as tropical forests.

4.31 Beyond adhering to sustainability standards, it is perhaps unrealistic to require that biofuels production does not lead to *any* harm to environmental sustainability. In other words we should not demand perfection, but we should require that biofuels do better – or significantly better –

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[406] Note that this principle does not necessarily assume (nor deny) a 'positive' human right to food and water. The arguments appeal to a negative right: people have a negative right that others not act in ways which deprive them of food or water. A positive human right to food is affirmed in the Universal Declaration of Human Rights of 1948, art 25, and the International Covenant on Economic, Social and Cultural Rights of 1976, art 11 (the argument here is indebted to that advanced in another context by Pogge T (2008) *World poverty and human rights: cosmopolitan responsibilities and reforms*, 2nd Edition (Cambridge: Polity)).

[407] Universal Declaration of Human Rights of 1948, art 17.

[408] C169 Indigenous and Tribal Peoples Convention 1989 (International Labour Organization), art 14–19.

[409] The suggestion here is in part prompted by: United Nations (2009) *Kimberley Process Certification Scheme*, available at: http://www.kimberleyprocess.com/documents/basic_core_documents_en.html (concerning the conditions for just acquisition of diamonds). See also Thomas Pogge's discussion of the 'resource privilege' in: Pogge T (2008) *World poverty and human rights: cosmopolitan responsibilities and reforms*, 2nd Edition (Cambridge: Polity), pp118–121; and Leif Wenar's discussion in: Wenar L (2008) Property rights and the resource curse *Philosophy & Public Affairs* **36**: 2–32.

than fossil fuels with respect to environmental protection, and that they respect sustainability standards.

4.32 In light of these recommendations, we recognise the need to consider the adoption of genetic modification techniques where these can contribute to sustainable biofuels developments that meet the Principles proposed in this report. Current concerns about food security and environmental protection are prompting a global reassessment of the role of genetically modified crops in contributing to minimising land use and to food security in all food production systems, not just those of developing countries (see discussion in the next chapter). We also acknowledge the need to ensure that the regulatory systems in place for all crops are sufficient to ensure the sustainability of agricultural and environmental systems.

Principle 3: Climate change

Biofuels should contribute to a net reduction of total greenhouse gas emissions and not exacerbate global climate change

4.33 Man-made climate change already imposes and will increasingly impose great harms on many people, in particular those most disadvantaged. It leads to loss of life (through starvation, flooding and severe weather events) and threats to health (through water-borne and vector-borne diseases and heat stress), and undermines access to food and water.[410] Where there is loss of livelihood and of living space/territory because land is no longer habitable owing to climate change effects, this could lead to irreversible loss.

4.34 All the moral values developed above underpin the need to alleviate climate change:

- the human rights and global justice perspective, because climate change threatens the livelihood, subsistence, health and well-being of populations, in particular in the developing world;[411]
- solidarity and the common good, because as a global phenomenon with potentially disastrous consequences for the whole world, climate change affects the interests of all of humankind, and there is a particular obligation to protect vulnerable populations from its negative effects; and
- sustainability and stewardship, because climate change endangers many of the world's natural resources and may threaten life on the planet for future generations.

4.35 The case for climate change mitigation within this framework is strong, and this carries over to the evaluation of biofuels. There is a 'negative' requirement not to harm people through climate change effects by consuming energy via the introduction of biofuels.[412] Hence, a biofuels technology is only acceptable if it does not exacerbate climate change, for example as determined by GHG emissions. The common good perspective, moreover, calls for more demanding results: biofuels should lead to net GHG emissions savings.

4.36 The previous three Principles have all concerned potential harms to populations or ecosystems through the production of biofuels, and justify implementing protective measures. In this way,

[410] Intergovernmental Panel on Climate Change (2007) *Climate change 2007: synthesis report*, available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

[411] For an account of how climate change jeopardises human rights to life, health, food and water, see: Caney S (2009) Climate change, human rights and moral thresholds, in *Human rights and climate change*, Humphreys S (Editor) (Cambridge: Cambridge University Press), pp69–90. See also: Office of the High Commissioner for Human Rights (2009) *Report of the Office of the United Nations High Commissioner for Human Rights on the relationship between climate change and human rights* (A/HRC/10/61), available at: http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G09/103/44/PDF/G0910344.pdf?OpenElement.

[412] Obviously, climate change effects are time-delayed: effects of today's activity impact decades later. Therefore, GHG emissions are taken as a representation of how harmful a technology is to the climate.

they embody 'negative' elements – i.e. they protect individuals or communities against being harmed or deprived of a vital good. In some cases they could thus prohibit certain activities. However, biofuels – in particular the new approaches – are expected to generate significant benefits. These may come in many different forms (e.g. financial benefits or benefits related to climate change, energy security or development), accrue along different timescales (long term or short term) and be relevant to many different stakeholders, ranging from individuals to populations and from companies to countries. The following two Principles both consider the kind of benefits that biofuels may yield, and thus include 'positive' elements – i.e. claims to some of these benefits. They differ, however, in their focus. Principle 4 focuses on the treatment of those involved in the production of biofuels, and Principle 5 focuses on sharing of benefits with others who are not necessarily involved in the production process.

Principle 4: Just reward

Biofuels should develop in accordance with trade principles that are fair and recognise the rights of people to just reward (including labour rights and intellectual property rights)

4.37 An important aspect of biofuels is the reward that accrues to people in their production. In considering the permissibility of biofuels, it is necessary to establish that those involved with the production of biofuels are not denied a just reward. This is relevant in two areas: just compensation for work; and, particularly for the new approaches, intellectual property rights (IPRs).[413]

4.38 Article 23.3 of the UDHR requires that everyone who works has the right to just and favourable remuneration, ensuring an existence worthy of human dignity.[414] Appropriate remuneration for work has become one of the undisputed standards of modern work life and is, for example, encapsulated in standards of fair trade.[415] Solidarity, as a value governing the relations between populations, also emphasises that it is not acceptable to exploit the work of poor populations in developing countries for the sake of richer populations in the developed world.

4.39 These ethical values demand adequate wages for workers in biofuels production, measured, for example, by a recognised and enforceable minimum wage within a country that is set above poverty levels. Many countries have some minimum wage scheme in place and, where this is not the case, our argument strengthens the need to establish one. It should be noted that the need for appropriate remuneration holds particularly for workers in biofuels production in developing countries, where labour rights can be quite weak. There can be justified exceptions, for example where farmers grow crops for their own use.

4.40 The ownership of intellectual property is often justified on the basis of the right to property in which one has invested time, perhaps money and also knowledge. Another frequently cited aspect is reward theory, whereby the inventor is given a right to control the invention as a reward for the benefit to society of the placing of the invention into the public domain. Professor Joan Robinson has explained very well the practical dilemma embedded in all intellectual property systems, which then, in many cases, leads to ethical concerns: "The justification of the patent system is that by slowing down the diffusion of technical progress it ensures that there will be more progress to diffuse…Since it is rooted in a contradiction, there can be no such thing as an ideally beneficial patent system, and it is bound to produce negative results in particular

[413] Intellectual property rights, very broadly, are rights granted to creators and owners of works that are the result of human intellectual creativity. The main intellectual property rights are: copyright, patents, trade marks, design rights, protection from passing off, and the protection of confidential information.
[414] Universal Declaration of Human Rights of 1948, art 23.
[415] World Fair Trade Organization (2009) *10 standards of fair trade*, available at: http://www.wfto.com/index.php?option=com_content&task=view&id=2&Itemid=14.

instances, impeding progress unnecessarily, even if its general effect is favourable on balance".[416]

4.41 The values of solidarity and common good imply that contributing towards knowledge about biofuels production can be seen as contributing to the common good of striving for climate change mitigation and energy security. If we are to find ways to lower GHG emissions while securing energy demands, we will need to advance our knowledge about suitable technologies to eventually replace those based on fossil fuels. Solidarity demands that such knowledge be shared in order to support the most vulnerable. On the other hand, companies will not be able to make the very large investments needed to convert knowledge into practical benefits unless they can be assured of a reasonable period of exclusivity in which to reap sufficient rewards. It has been argued that the disclosure of knowledge and the availability of a new product is the way this knowledge is shared and provides the benefit to society. In order to give full effect to Principle 4, it is important to recognise that while the existence of IPRs can provide a reward for innovation, it is the exercise of IPRs that can ensure the knowledge is shared and thus fully meet the requirements of Principle 4.

4.42 As another dimension, those who promote the production of biofuels are under a responsibility to exercise due care when encouraging the economically vulnerable to convert land and natural resources for use in biofuels production. In particular, it is important not to encourage extensive changes in developing countries, only to decide shortly thereafter not to purchase such biofuels, for example because of abrupt changes in policy in the developed world.

4.43 It is crucial here to develop clear, transparent and stable medium-term plans. Of course, companies in developed countries may quite reasonably change their plans and are not required to be permanently locked into an earlier policy when other more advantageous options arise. Nonetheless, this does not preclude reaching agreed medium-term arrangements that honour the reasonable expectations of the vulnerable, especially those in developing countries, while retaining some flexibility for companies investing in biofuels production.

Principle 5: Equitable costs and benefits

Costs and benefits of biofuels should be distributed in an equitable way

4.44 The potential benefits associated with future biofuels may, however, go far beyond just reward for the work and knowledge involved in the production of biofuels (Principle 4). There may be other more general benefits that can potentially be shared with a wider range of people. The values of solidarity and the common good call for the protection of the vulnerable, and a commitment to distributive justice similarly calls for the fair distribution of such benefits. If biofuels do yield benefits either to i) energy security, ii) enabling people to meet their responsibilities to mitigate climate change, iii) increased economic development/revenue/jobs, or iv) other benefits, then what is a fair way to share these benefits? Bringing in the concept of global justice, how should the benefits be distributed among members of developed countries and developing countries? We propose the following two rules:

- *(Rule 1) Symmetry between benefits and harms*: benefits should be allocated to people in proportion to the extent to which the generation of biofuels has adversely affected their interests or exposed them to risk, such as through pollution, higher food prices (where clearly attributable) or changes in landscapes and livelihoods.

- *(Rule 2) Benefit sharing to further Millennium Development Goals*:[417] the Member States of the United Nations have pledged to meet eight Millennium Development Goals. Where biofuels provide a sustainable form of transport fuel and where they bring opportunities for

[416] Robinson J (1956) *The accumulation of capital* (London: Macmillan and Company), p87.
[417] United Nations (2010) *Millennium Development Goals*, available at: http://www.un.org/millenniumgoals/.

development then – in light of the ideas of the common good and global justice – there is a case for incentivising the production of biofuels so that the production process shares the benefits in ways that further these goals.[418]

4.45 These rules are helpful in considering what benefits and burdens might arise, and how they should be distributed. Chapter 5 discusses further how they might be applied through policy, for example in public–private partnerships.

Beyond Principles 1–5: is there a duty to develop biofuels?

4.46 An ethical evaluation of any technology tends to focus on harms that the technology brings or might bring to populations or natural resources, and whether some of these harms make it unjustifiable to pursue the technology ("*first* do no harm"). This is reflected in the Ethical Principles of this framework, of which the first three are the strongest.

4.47 A biofuels technology or policy tested against Principles 1–5 could come out somewhere within a wide range. It could clearly violate one or several Principles, and thus should not be pursued. It could also violate one or several Principles, but in ways that could be amended and managed through policy. Finally, a biofuels policy or technology could satisfy all Principles. In the latter cases, a biofuels policy or technology is *morally permissible*. But might there be a duty to develop biofuels?

Principle 6: Duty?

If the first five Principles are respected and if biofuels can play a crucial role in mitigating dangerous climate change then, depending on additional key considerations, there is a duty to develop such biofuels

4.48 Once the first 'do no harm' step of the ethical evaluation has been undertaken and safeguards have been developed, it is important to consider whether there may be a duty to promote any biofuels. The benefits of biofuels production – and the need to meet certain pressing moral objectives, most notably averting dangerous climate change – may be such that it becomes a responsibility to consider the development of a technology in order to reap its benefits. The main expected benefits of biofuels production have been described in earlier chapters, and they relate to to the three main drivers: i) climate change mitigation; ii) energy security; and iii) economic, rural and/or agricultural development. As laid out in Chapter 1, and given a commitment to human rights and a common good perspective, these constitute important social goals.

4.49 In light of climate change's potentially catastrophic effects on the enjoyment of individual human rights and its violation of the ideals of the common good, we affirm that there is an ethical imperative to prevent dangerous climate change. Where a biofuels technology – whether established or one of the new approaches – can help realise the pressing need to mitigate dangerous climate change then it may be that there is a duty to promote such biofuels.

[418] It might be asked what should be done if these rules conflict. We make two recommendations here. First, one widely held conviction is that the negative duty not to harm others generally takes priority over other positive duties. Given this, then, other things being equal, the duty to compensate those adversely affected by biofuels production and to protect people from being adversely affected (rule 2) takes priority over other principles of benefit sharing. Second, however, when other things are not equal, then the other rule may take priority. If, for example, i) the disadvantages imposed on others by biofuels production are fairly slight, and ii) the benefits could be distributed in such a way that they would make a considerable contribution to the successful pursuit of Millennium Development Goals, *then* there may be a case for distributing the benefits according to rule 1 rather than rule 2.

4.50 Firstly, Ethical Principles 1–5 should be met. Secondly, whether there is such a duty depends on a number of additional key considerations. These are:

a *the absolute cost consideration*: is the cost of developing biofuels too great? Even where a biofuels technology brings benefits and enables humans to meet pressing ethical objectives, this does not lead to a duty to develop such biofuels (and for state investment in it) if the costs (which might be direct financial costs or opportunity costs) incurred are out of all proportion to the benefits generated. Such costs could entail greater harms, outweighing the benefits of biofuels. This thought does not preclude considerable financial investment, but it does insist that this can be justified only if the resulting benefits are proportionate to the cost.

b *the alternative energy sources consideration*: are there other energy technologies which can also help realise the goal of mitigating climate change and which do so more effectively (e.g. they involve greater reductions in GHG emissions for a similar or lower cost)? There are other potential energy sources for road transport (e.g. the production of hydrogen or electricity from low carbon technologies such as geothermal, solar photovoltaics, hydroelectric, tidal, wind and nuclear). There are also possibilities for increasing energy efficiency of existing energy sources for transport. Decisions about biofuels have to be taken in the light of these other options (and their merits and demerits) and what would be the best policy mix. This could effectively mean that biofuels may not be simply an alternative to other ways of achieving low carbon transport, but that they may be deployed as part of a portfolio in many countries which could also include other vectors such as electricity, hydrogen, etc.

c *the opportunity cost consideration*: might the resources used in biofuels production (such as biomass) be required in order to realise some more pressing ethical imperative, such as, for example, bioenergy to meet other fundamental needs in a climate-protecting way? Biomass may be used for heating and cooking and these needs must also be borne in mind when considering whether to develop biofuels production.

d *the uncertainty consideration*: it is important to recognise that there is likely to be great uncertainty about the technologies and any future developments, for example regarding full life cycle assessment outcomes, costs of scaling up, and social impacts. This suggests that, rather than relying on a single snapshot of the potential of technologies, their likely costs, alternative uses of biomass and alternative energy sources, it is important to review and monitor each of these factors on a continuing basis.

e *the irreversibility consideration*: it is also important to be aware of the possibility, and dangers, of setting in process irreversible policy decisions. There is, thus, a need to guard against implementing an irreversible set of commitments that involve a sub-optimal use of biomass and/or alternative energy sources. Again, this implies a need for continuing monitoring of decisions and policies.

f *the participation consideration*: while assessing whether and how these conditions apply, a commitment to procedural justice demands sufficient inclusion of relevant voices in agenda setting and policy formation. For example, those directly affected by biofuels production should be heard regarding their concerns about local impacts and potential negative side effects.

g *the overarching 'proportionate governance' consideration*: it has been shown that 'one size fits all' approaches to policy are not successful in complex areas. Instead, policy needs to be symmetrical and proportionate to the risks and benefits to individuals and society, allowing for different applications depending on the context.[419]

[419] Academy of Medical Sciences (2011) *A new pathway for the regulation and governance of health research*, available at: http://www.acmedsci.ac.uk/p99puid209.html.

4.51 Where biofuels honour the first five Principles, and where they enable society to realise its overarching duty to mitigate dangerous climate change in ways that meet the additional considerations, there is, to that extent, a duty to develop the production of biofuels.

4.52 However, this raises the question of who then would bear the duty to develop biofuels. In line with the commitment to human rights and to the ideals of solidarity and the common good, we affirm that the burden should not be borne by the least advantaged and most vulnerable, but should instead be borne according to ability to pay. Those with the greatest ability to pay should bear the lion's share of the burden. Second, and in addition to this, those who have used up a greater share of fossil fuels have a responsibility to act so that others – current and future – have alternative energy sources (including possibly biofuels) available to them. In short, the polluter should pay.[420]

4.53 Ascertaining when Principle 6 applies will require a case-by-case examination in the light of a number of practical and scientific considerations. Such a judgment is inherently complex as it must also consider issues surrounding the scale of production that is appropriate, the need to spend resources effectively and carefully, and the fact that there are both alternative ways to generate energy and alternative uses of a particular feedstock which might be more advantageous than its use as a biofuels feedstock. These issues are taken up through the discussion of current and future policy and regulation for biofuels in Chapters 5 and 6.

[420] This could be limited, as has been done with climate change policy, to the years following 1990, in order to avoid complex issues around retrospective compensation for past pollution.