



# METIS

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THE ENVIRONMENT

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## ABOUT IPPR@UNIVERSITIES

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For the students participating in the IPPR@universities programme, we believe it offers an opportunity for them to enhance their understanding of policymaking and politics, to see their thinking reach a wider audience, and to build their enthusiasm and skills in policymaking, potentially equipping them for a future career in the area.

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**IPPR@universities**

# FOREWORD

**Marc Geddes**  
Executive Editor

Since 2010, the IPPR@universities programme has grown steadily. Now in its third year, it provides unique opportunities to its participants, including work experience to students at four universities (comprising Sheffield, Warwick, York and Manchester). The programme provides a platform for students to share ideas with each other, academics, thinktank researchers and the wider policymaking world. *Metis* is an important part of this programme, giving students at all four universities the opportunity to engage rigorously with public policy questions and receive feedback from researchers at IPPR. Above all, *Metis* brings students together and allows them to collaborate on issues that matter.

In 2011–12, IPPR@universities has focused on the issue of the environment and its relationship to politics, economics and ethics. This year, *Metis* has welcomed student contributions in a variety of fields including geography, politics, economics and education. Articles are arranged in groups according to their theme. The first four articles in this issue address various aspects of the debate on sustainable consumption. Guy King unpicks the relationship between consumption and waste, Ieuan Ferrer puts forward the case for a tax on meat, Efraim Parra considers the obstacles hindering the role of GM crops in providing future food security and finally, Chisom Ubabukoh turns to the global picture and wonders how to go about feeding seven billion people. Energy futures provide the focus for the next two articles. Robin Lovelace engages in some myth-busting around carbon capture and storage technologies and Adela Putinelu considers the effectiveness of emissions trading as a policy aimed at reducing fossil fuel dependence. The final articles engage with the currently prominent debate about ‘green’ growth. Dominic Wyard asks whether there has to be a trade-off between the economic growth of developing countries and environmental concerns and Daniel Cole considers how sustainable capitalism might work and what it would look like. These eight articles together amount to a broad vision for future environmental security.

This year *Metis* has extended its reach to new policy issues and a wider range of academic disciplines. None of this would have been possible without the hard work of our affiliated student societies: Canvas at the University of Sheffield Students’ Union, Warwick Think Tank Society at the University of Warwick Students’ Union, the York Student Think Tank at the University of York Students’ Union, and the Challenging Orthodoxies Society at the University of Manchester Students’ Union. All those involved – the editors, writers and

researchers – deserve congratulations for the results of their efforts. Feedback was kindly provided by Richard Darlington, Clare McNeil, David Nash and Reg Platt of IPPR, Andrew Pendleton of Friends of the Earth, and Matthew Lockwood of the Institute of Development Studies. Furthermore, *Metis* would not have been possible without the help of members of the IPPR team – Tim Finch, Glenn Gottfried, Laura Bradley and Mavis McKenzie Cecil – who have given their time to make this journal possible.

Thanks are also due to the following editors, sub-editors and IPPR@universities representatives for their efforts: Mitchell Evans, Dann Godsell, Dan Iley-Williamson, Mazyar Karimian, Becky Kendall, Ruth McGinty, Alex Pashley, George Richards, Harriet Rowley, Majja Salokangas, Luke Temple and Cathy Wilcock.

# A BALANCING ACT

## ETHICAL CONSUMPTION AND WASTE

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As the scale of the current economic malaise becomes ever more apparent, the unequal relationship between issues of the economy and the environment means that ethical concerns can often take a back seat. In this article I argue that one area of policy where these issues are linked and produce mutual benefits is waste management. I further argue that for the implementation of policy to progress effectively requires a combination of enhancing education and incentivising 'ethical consumption', defined as the 'personal allocation of funds, including consumption and investment, where choice has been informed by a particular issue' (The Co-operative Group 2011). Waste reduction is increasingly important as it has been recognised that ethical consumerism is as much about choices of disposal as about purchasing (Bulkeley and Gregson 2009).

Examined in the context of the UK grocery market, this article argues that new policies and schemes are needed to reduce high levels of edible food waste, which often result from confusion over date labelling, and to incentivise the recycling of packaging, which currently lacks commercial appeal. These have obvious environmental advantages yet also benefit retailers, create jobs in the green economy and ease the burden of waste management on local government. From an extensive list of possible methods, two are examined that are paramount in achieving ethical consumption.

### **Consumption and waste in context**

It is worth taking a moment to consider why achieving this is desirable. The problem has been well recognised by the current government. The vision set out in the Coalition government's waste policy review states:

'We need to move beyond our current throwaway society to a 'zero waste economy' in which material resources are re-used, recycled or recovered wherever possible, and only disposed of as the option of very last resort. This requires a new public awareness in our attitude to waste' (Defra 2011: 10).

The scale of the challenge facing the government is considerable. Food waste is extensive in the UK, with approximately 6.7 million tonnes of food waste being produced in households annually (WRAP 2007). The vast majority of this goes to landfill and has both environmental and financial implications. Greenhouse gas emissions are released in two ways. They are produced directly from methane originating from rotting food, and indirectly from the carbon emitted from food production, waste processing, transportation and storage.

As for the financial consequences, WRAP calculates that a typical UK household throws away between £4.80 and £7.70 in edible food each week; equal to £250–400 a year. In addition to these costs are those that occur through rising taxes from the EU Landfill Directive. A consequence of this has been rising levels of fly-tipping, now estimated to cost the taxpayer £40 million a year (Countryside Alliance 2011).

In terms of packaging waste, the UK has improved significantly since 2008, meeting or exceeding targets set out under the EU packaging directive. This clearly illustrates that a concentrated policy effort can be influential, as in 2011 the UK recovered just under 70 per cent of retail packaging compared to just under 30 per cent in 1998 (Defra 2008). However, quantities of packaging are still rising and the directive is shortly to be revised with tougher targets being set. With many packaging materials such as cans, bottles and cartons consumed 'on the go' and disposed of in street bins that go to landfill (Hill et al 2008), innovative recovery methods must be investigated as existing kerbside collection systems appear to be static and inflexible.

### **Food labelling**

A combination of rigorous policy and awareness over food labelling is required to reduce food waste. It is an area where simple changes can make an immediate financial impact for households trying to maintain strict budgets. Reducing food waste has become a higher priority for shoppers in the recent climate of austerity, helping them to save money whilst maintaining quality and satisfying ethical concerns (Maton 2011). As evidence suggests that sales volumes are currently stagnating (Wood 2011), it could therefore be advantageous for retailers to turn to food waste initiatives, enhancing their own green credentials and promoting loyalty amongst ethical consumers.

Maton (2011) indicates that two of the top five reasons for consumer waste directly concern date labelling information, that is, products passing their 'use-by' or 'best-before' date. More generally, environment secretary Caroline Spelman claimed that confusion over food labelling was responsible for an estimated £750 million of the £12 billion in edible food wastage each year (BBC News 2011). Recently published guidance by Defra encourages manufacturers to use only the legally required 'use-by' or 'best-before' date, and to remove the unnecessary 'sell-by' and 'display-until' labels. While this author fully endorses this reduction of ambiguity, the changes represent something of a missed opportunity to eliminate consumer confusion by raising understanding of the technical differences of labelling (Lucas 2011). A first recommendation therefore is that policy concerning food labelling, as well as being simplified and making a clear distinction between different dates, should be directed toward improving awareness. A recent example is the decision by Sainsbury's in conjunction with WRAP to remove advice about freezing food on the day of purchase and informing customers it can be done until the use-by date (BBC News 2012). This clarity has the immediate effect

of allowing consumers to make better-informed decisions rather than exercising caution and going straight to disposal.

The cycle of food turning from freshly packaged produce into a waste item is a grey area which urgently requires more public awareness. Leftovers not being eaten in time, being unsure when something is fit to eat, and products no longer looking appetising are all popular waste excuses (Maton 2011). Campaigns such as the Love Food, Hate Waste initiative launched by WRAP in 2008, which tackled such problems by promoting information on meal planning, portion sizes, recipe ideas and storage tips, are vital to maintain. Given the extensive media coverage and support from the main grocery retailers and many local councils for the campaign, and the demonstrable financial returns from addressing a lack of awareness, it is disappointing that WRAP have indicated that their focus on communication of this issue may shift (Osborne 2011). A second recommendation is that although budget cuts to this organisation may be necessary, communication and education about waste should be sustained.

### **Depository refund schemes**

Despite improvements in packaging waste reduction some are still calling for more significant change (Gyekye 2011). Outlined here is an alternative to existing schemes that has significant public backing. It is known as a depository refund scheme (DRS). In many European countries, American states and Canadian provinces, these schemes are now mandatory and well-established. In the UK, such schemes have only had limited trials, but where implemented they have proved successful.

To outline the scheme briefly, the two main components are a central administration system and deposits on beverage items. The costs of deposits are paid back to the producers, by wholesalers or retailers, upon sale. Similarly when the consumer purchases a beverage they pay the deposit to the retailer. When the consumer returns containers, the deposit is returned and the retailers are reimbursed from the central system. In a nutshell, the system financially incentivises recycling through consumption. Moreover, the system works more efficiently with higher recycling targets in place.

In the Coalition government's 2011 waste policy review the scheme was rejected primarily on the grounds of the high setup costs involved, with the decision being made to concentrate on making existing collection systems more efficient. This is disappointing for two reasons. First, because it undermines the Coalition's stated intention of incentivising recycling and second, because there is significant public support for such schemes. A poll conducted by Ipsos Mori in March 2011 indicated that 60 per cent of people would be in favour of such a scheme.

A study published by the Campaign to Protect Rural England (CPRE) calculated that a national DRS could produce an environmental benefit of £69 million and save up to 607kt CO<sub>2</sub> per annum (Hogg

et al 2010). Furthermore it is calculated that it would save local authorities approximately £160 million in waste management costs (reducing the tax burden and easing pressure on local authorities to cut services). CPRE emphasises the point of a DRS reducing litter by generating an incentive not to throw away waste. The initial setup costs for such a scheme are not insignificant at £84 million per annum and £700 million per annum to run (ibid). But the report argues that a properly implemented central system that includes a large number of producers and retailers will make joining manageable. Moreover, an updated study suggests that introducing the scheme would create between 3,000 and 4,300 full-time equivalent jobs (Hogg et al 2011). Having implemented the system, retail stores can compete through their own ingenuity in deciding how to reward customers. In one of the few trial schemes implemented in the UK, nine Tesco stores in Scotland unveiled reverse vending machines and rewarded customers with green Clubcard points when recycling bottles and cans were returned (Goldstein 2008). In this case, the number of journeys needed for waste collection was also reduced. A DRS facilitates customer loyalties with individual stores and ties the practice of high recycling rates together with consumption and relative financial gain for the customer. Each fosters the other and short term costs are swiftly overcome.

## Conclusion

This article has made the case that vibrant consumption and ethical waste practices are not mutually exclusive. At a time when 33 per cent of Britons now acknowledge that they would foster economic growth at the risk of damaging the environment – higher than the US or Canada (Angus Reid Poll 2011) – policy that can ensure environmental issues remain publicly prevalent while also proving economically viable should be given high priority. Both efficient, educated food labelling and DRSs prove that a balance can be struck, with produce being retained and used more efficiently, alongside recycling of packaging being incentivised and contributing economically.

The desire among consumers to make ethical decisions over their waste exists. Despite this, the drive to implement policy that addresses such issues has been slow in coming. Now is the time for that to be rectified. In tough economic circumstances it is time for retailers, producers and government policymakers to be bold and add their backing to consumers.

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# THE CASE FOR A MEAT TAX

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The government is trying to reduce our consumption of red meat. Recognising the negative side-effects of excessive red meat-eating, it is advising UK citizens to eat less red meat. However, the government's approach of issuing advice and hoping this changes behaviour is not likely to work. To change behaviour we should tax the consumption of red meat.

In the UK, a quarter of us regularly eat more than 90g of red meat a day; the upper limit of what is healthy according to the government.<sup>1</sup> The health effects of high levels of red meat-eating are well known. An Oxford University study has suggested that excessive eating of red meat kills 45,000 people in the UK each year (Hickman 2010). As with the consumption of other products with negative health implications, eating red meat increases the burden on the tax-payer through its effect on the NHS, costing £1.2bn a year (ibid). As such, those who do not eat red meat to excess get hit in the wallet by those who do.

Furthermore, the consumption of both red and non-red meat fosters avoidable starvation in the poorest countries of the world. The production of meat is fundamentally inefficient. Eating is a transfer of energy from food to our own bodies. If we eat grain we are accessing that energy at the source. If we feed that grain to livestock, and then eat the resultant meat, we are getting much less energy. Meat production requires an average of 6kg of grain protein to produce 1kg of meat protein (UNESCO 2010). The more meat we consume, the more energy from grain we lose and the more grain we need. Thus, increases in meat-eating push up the price of grain.

Msangi and Rosegrant (2011) have analysed the impact of this effect in the context of rising meat consumption in the developing world. Whilst they emphasise that a shift to a diet lower in meat would not be a solution to hunger in the developing world, they argue that if the developed world, including Brazil and China, cut their consumption of meat by half, by 2030 there would be 2.3 million fewer malnourished children in the world.

Additionally, meat-eating impacts negatively on the environment. Pimentel and Pimentel (2003) demonstrated that for every 1kcal of grain protein produced 2.2kcal of fossil energy is required, whereas for every 1kcal of meat protein produced 25kcal of fossil energy is needed. Even if one does not follow the prevailing scientific view on climate change, unnecessary fossil fuel depletion cannot be desirable.

As such, it is clear that the government is right to want to reduce the consumption of red meat, and it appears that it should broaden its aim to reduce meat consumption in general. However, its current strategy, which is merely to issue guidance, is certain to fail. As Professor Michie has argued (in HoL 2011) communication campaigns are not very effective on their own – to change behaviour the government must also intervene in other ways. Given that the aim is to reduce the consumption of meat, rather than to eliminate it, price increases seem to be the most appropriate strategy. Furthermore, this strategy has worked in similar circumstances in the past. The OBR predicts that tobacco receipts, now 0.6 per cent of GDP, will fall to 0.3 per cent of GDP, and that fuel receipts, now 1.8 per cent of GDP, will fall to 1.1 per cent by 2030 (Economist 2011). In addition, the government is currently moving towards introducing a minimum price for alcohol,<sup>2</sup> demonstrating that it recognises the effectiveness of pricing strategies.

But what kind of intervention on pricing is best for tackling meat-eating? As it stands, meat products fit for human consumption are not subject to VAT. One part of taxing meat would be to change this. Giving meat a tax break is perverse given the negative health and environmental effects it has – this is a change that would be easy to make. Fuel and cigarettes are subject to VAT. Meat should be too.

However, this would not alone be enough to change the way that politicians and the population at large view and deal with meat-eating. To indicate that meat-eating should be reduced, meat must also be subject to a more obviously punitive tax, similar to the taxes on fuel and cigarettes. Such a tax could start at a low level, with plans for it to be gradually raised. Thus, the government would be given a policy lever that could target meat-eating specifically. Furthermore, the government would be incentivised to raise the level of the tax, as doing so would appear virtuous whilst increasing the Treasury's revenue. The introduction of this kind of tax is what is required to truly change attitudes and behaviour regarding meat.

There is one obvious criticism of such a proposal. It is extremely likely to be regressive – disproportionately hitting the poor. This is an unfortunate side effect. However, such a sales tax is by far the most direct and implementable way of curtailing people's meat-eating. Furthermore, to mitigate this worry a tax break for the poor could be funded out of the revenues raised by the change.

Another worry is that the introduction of such a tax would not significantly change our habits in the UK for a long time. Alongside the fact that a meat tax in the UK would not reduce meat-eating in other countries, and thus would seem unlikely to have much impact on world child malnourishment, this is a worry. However, any wholesale change in rich world policymaking needs a country to take the lead. Furthermore, with successive rises in the hypothetical meat tax, habits would begin to change.

The negative externalities of meat-eating are extremely large. The government is attempting to reduce the consumption of red meat, but its current strategy will not work. The market price of meat does not reflect the cost of meat production to the UK, and to the world at large. Price rises, alongside targeted communications campaigns, are proven to lower the consumption of goods. Therefore, the government should act – it should introduce a meat tax.

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# BRITISH POLITICS AND GM CROPS

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## Introduction

In the last decade genetically modified organisms (GMOs) have emerged as one of the most significant developments in modern agriculture, due to their potential to ensure food security worldwide. However, the transition to the use and consumption of genetically transformed products has generated an intense debate about the possible impacts and risks posed to human health, agricultural sustainability and the environment (Fresco 2001). In the case of the European Union, the public debate about GMOs has been particularly polarised; it is not uncommon to find sceptical attitudes towards GMOs from institutions and politicians. However, although similar to those in other parts of the world, the current EU regulatory framework for GMOs has generated some discomfort in the food industry due to the lack of efficiency in the approval process for GMOs. It is claimed that this framework generates extra economic costs for farmers who require access to GM products in order to remain competitive in the global market.

The aim of this article is to tease apart the economic implications of the current regulatory policy for GMOs in the EU. It discusses the limitations of the current regulatory framework and proposes constructive solutions geared at addressing these problems. The first part of this article will discuss and analyse the different attitudes towards GM crops.

## Zero tolerance to GM crops: a problem or a solution?

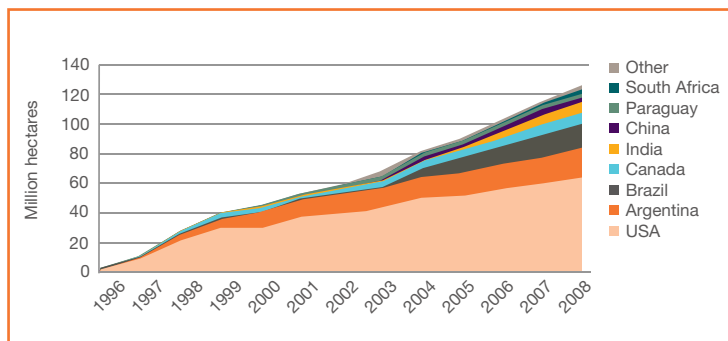
Technological developments in recent decades have enabled the creation and development of new processes, products and techniques that have generated profound changes in the agro-food system (Ward and Almås 1997). A great achievement has been the development of GMOs, which are created by altering genetic material (DNA or RNA) through different artificial methods (HSE 2000: 15).

Although when they were first developed the applicability of GMOs to agro-industry was not immediately clear, GMOs generated considerable concern from the scientific community and some governments over the potential risks to public health (such as possible alimentary chronic risks produced by unpredictable insertional mutagenesis effects, metabolic effects, or from the new pesticide residues – see de Vendômois et al 2010). It was not until the late 1980s and early 1990s that international organisations such as the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) created a regulatory framework to control the

production of such organisms, which were grown on a small scale in Canada and the United States at the time.

Even though the first experimental trials of GM crops began in the late 1980s, it was not until the mid 1990s that the use of GM crops became widespread across the world. Figure 1 shows how from 1996 to 2008 the use of GM crops, especially soybeans, corn, canola and cotton, increased exponentially. This was due to their herbicide tolerance, insect resistance and low cost to the international market (see Zika et al 2007 and Stein and Rodríguez 2009).

**Figure 1:**  
Area cultivated with  
GM crops by country,  
1996-2008 (million ha)



Source: Stein and Rodríguez-Cerezo (2009)

Figure 1 shows that the use of GMOs is becoming more common in food-exporting countries such as Paraguay, Argentina and Brazil which, according to Eurostat, supplied more than 90 per cent of imports of soymeal and nearly 75 per cent of soybeans for the EU in 2011.<sup>1</sup> In these terms, with the constant increase of GM crops in the main exporting countries (Argentina's production is already about 94 per cent GM while Brazil's is at least 65 per cent and rising), the EU food sector argues that the current GMO regulatory framework blocks access to new and more efficient GM products (see Defra 2008).

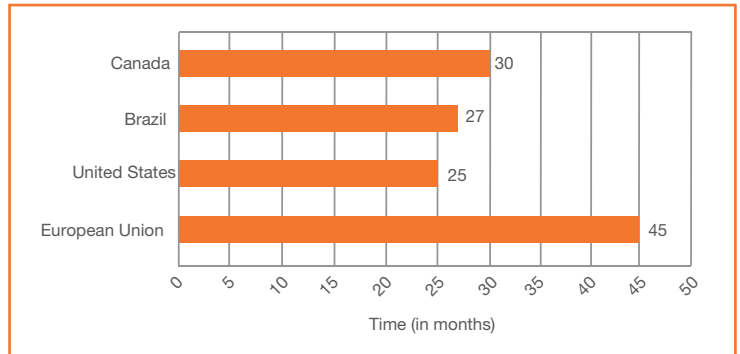
A perfect example that illustrates the concern of the food and feed industry about the consumption of GM products is the 2006–2007 ban on importing new GM maize (Herculex) and corn-based products from the United States, because the use of new transgenic maize and corn was not approved at that time by the UK (Defra 2008). It is argued that the core of this problem is the EU regulatory system's lack of capacity to adapt to new developments in global GMO use. According to the European Association for Bio-industries (2011) the EU approval process for GM products is substantially longer than in similar systems.

In light of the above I suggest that these kinds of limitations in the regulatory system could have two main economic impacts. The first impact is related to the possible trade repercussions. According to the European Association for Bio-industries, the slower authorisation

rate in the EU has 'caused trade problems costing billions [of euros] to importers, food/feed processors and farmers, hence the EU's main suppliers of protein are less inclined to wait for EU approvals prior to approving and planting in their country' (2011: 6).

**Figure 2:**

Average time required for GM products' approval, 2011 (months)

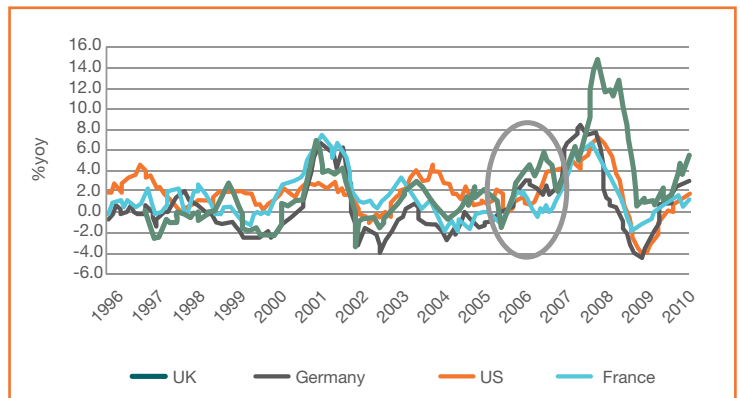


Source: European Association for Bio-industries (2011)

The second impact is related to the additional costs for the food and feed industry caused by the delay of the GM authorisation process. Basically, the limited supply of essential GM products is distorting prices. For instance, prices of approved GM foods had an extra cost of £30 per tonne compared with non-approved GM foods in 2010. This impacts 'the viability and competitiveness of the EU livestock sector, as well as impacting on EU consumers [see figure 3], who are used to consuming significant amounts of meat, eggs and dairy products in their diets' (ARDEC 2010: 30).

**Figure 3:**

Food price inflation rate\*



Source: Flanders (2011)

Notes: \*The ban on corn and soybeans in the US in 2006/07 inflated food prices significantly.

## Recommendations

The challenges and problems that accompany the use and consumption of GM products are varied and complex but, as pointed

out above, it is possible to identify possible strategies and routes by which the EU could improve its regulations on the import and consumption of GM products.

1. **More adaptability:** integration between research networks and public institutions could speed up the approval processes of new GMOs and would allow public institutions to upgrade and adapt easily to new processes and trends in GMO production around the world.
2. **GM substitutes:** the development, research and identification of substitutes for soybeans and corn could reduce the prices of production in the food and feed industry, without any effect on the output levels of livestock production. For instance, 'some studies have shown that if soy in compound feed was totally replaced by lupine, standard milk production of high-producing dairy cows would not change, but milk fat percentage would be reduced' (ARDEC 2010: 40).
3. **Institutional cooperation:** the articulation and strengthening of relations between European regulatory institutions and those in producing countries would ensure the most competitive supply prices for the food and feed industry, thus reducing the negative economic impact of GM crops not yet approved by the EU. In this sense, if the GM crop areas approved by the EU were to increase in the main producing countries, it could successfully bring down the high prices facing the UK food and feed industry.

## Conclusion

The increasingly common use of GMOs in food production has created new challenges for public institutions and potential opportunities for the food and feed industry in the EU. However, in recent years it has become evident that the impact of new GM products has been limited, due to reduced institutional adaptability and lack of synchronisation between producer and consumer countries. This issue, known as the 'asynchronous approval' of GM products (IPTS 2009), has mainly affected the viability and competitiveness of food and feed industry, directly impacting on poorer consumers in the EU. Although the reconfiguration of the GM regulation system will not be easy, it is possible to identify a set of strategies which would allow the food and feed industry reduce the impacts caused by the global dynamics of agro-industry.

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# HOW TO THROW A DINNER PARTY FOR SEVEN BILLION GUESTS

## FOOD SECURITY AND ENVIRONMENTAL SUSTAINABILITY

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Climate change is a phrase that has been on everyone's lips in recent years. Many people are concerned that a time may be coming when the planet is no longer able to support our irresponsible activities and consumption. However, insufficient attention has been directed towards the important link between the environment and the threat of a global food crisis. I will attempt to make this link, discuss the associated policy issues and examine what can be done to resolve them through the analogy of the stages involved in throwing a party.

### **Make preparations**

There has been a raging argument over the viability and sustainability of biofuels as an alternative to fossil fuels. One aspect of this is the so-called 'food vs. fuel' debate, which raises the question of whether it is ethical to burn food as fuel while people starve (Ayre 2007). While this debate is important, there is another part of the argument which is often neglected: the fact that the production of biofuels, apart from burning up much-needed food, also contributes to the larger problem of environmental destruction. By promoting intensive mono-cropping cultures, the supposedly 'green' biofuel industry is in danger of inflicting destruction on the environment.

The first step in throwing a party is to draw up a guest list and send out invitations. In 2010 there were 925 million hungry people in the world, according to the Food and Agriculture Organization (FAO 2010). Even though food production has soared to never-before-seen levels, so too has the world population. The result of this is that per capita food production has dropped steadily. In other words, we now have many more people to feed with the same average level of food output. This reflects the argument made in the 18<sup>th</sup> century by the priest and social commentator Thomas Malthus in his 'Essay on the Principle of Population' (1798). Malthus painted a grim picture of the future, postulating that because food production increased at an additive rate and population increased at a multiplicative rate, a point in time would come when the world would be unable to feed its inhabitants. He argued that at such times, circumstances would arrange themselves to cause a mass reduction in population (through war or famine, for example). There is an issue with both food output and population. In October 2011, the UN announced that there were 7 billion people on the planet (UN News 2011). That's a lot of mouths to feed. The stage is set for a party of immense proportions.

### **Set the table**

After drawing up the guest list and dispatching invitations, one of the most important things to consider is how to feed everyone. The world is facing this challenge now – with the added constraint of a limited budget. The question we must ask is how we are to feed everyone in a sustainable manner without reducing the capacity of the planet to provide for future generations (Victor 2008). One problem with Malthus' theory of population explosion is that he underestimated human ingenuity. He did not predict a 'green revolution'. This so-called miracle ensured that average global production of corn, rice and wheat between the mid-1950s and the mid-1990s more than doubled.

However, between 2005 and the summer of 2008, the price of wheat and corn tripled and the price of rice climbed five-fold, spurring food riots in nearly two dozen countries and pushing 75 million more people into poverty (Bourne 2009). These soaring food prices were the result of demand outstripping supply (more people needing to eat than food could be provided for), giving weight to the argument made by Malthus.

### **Put up decorations (the environment)**

Whilst the food is cooking, it makes sense to put up decorations and make the party venue comfortable, inviting and hospitable. But the world is much more complicated – after a certain point, the amount of food which is available is inversely related to the health of the environment. When the party has 7 billion guests, there is the possibility of a conflict between the environment and food security, based on the premise that, in order to produce more food more rapidly, the environment will have to pay the price. During the green revolution, emphasis was placed on massive mono-cropping projects on large expanses of land and to achieve this, pesticides and fertilisers were used on a colossal scale, together with intensive irrigation systems. This led to the poisoning and depletion of the water table as well as a reduction in the quality of the soil in regions where this was practised.

Within this wider dialogue between food security and environmental sustainability is the question of whether biofuels are a sustainable substitute for fossil fuels. The government's decision to subsidise the production of biofuels has been commended in some quarters, but we need to ask ourselves at what cost. A problem arises because even though biofuels were intended to reduce carbon emissions from fossil fuel burning, they have now become a pollutant in their own right. The FAO states that nitrous oxides released from fertilizers that might be put in the ground in large monocultures will have up to 300 times more warming effect than the carbon dioxide from burning fossil fuels (FAO 2008).

Biofuelwatch.org argues that biofuels have the ability to increase greenhouse gas emissions, cause deforestation, and worsen local

air quality when used to produce electricity (Ernsting). In addition, the massive, intensive monoculture fields that have to be cultivated solely for the purpose of making fuel does serious damage to the land, reducing the amount of food available for present consumption as well as diminishing the capacity of the land to produce food in the future. As the FAO report concludes, 'If the objective of biofuel support policies is to mitigate global warming, then fuel efficiency and forest conservation and restoration would be more effective alternatives' (FAO 2008).

### **Welcome the guests**

All the issues that have been discussed should normally be addressed before the guests start arriving; but at this party, all the guests are already here. Even though we are aware of the need to find greener alternatives to fossil fuels, the burning of much-needed food is not the answer. The UK government will be subsidising the production of biofuels to the tune of about £3 billion every year by 2020 if current levels are sustained, but it would be better if these resources were channelled either to other forms of renewable energy like wind, solar or hydroelectric power, or to providing food for what Paul Collier calls 'the bottom billion' – the world's poorest people (Collier 2007). In 2008, Ruth Kelly, then transport secretary, announced that owing to environmental concerns, further study had been commissioned to review the UK's policy on biofuels, but that current commitments to biofuels were not going to be changed in the meantime (Adam 2008). The results of this report are expected this year and it remains to be seen what impact it will make. It is welcome news that politicians are thinking in this direction, but much more is needed.

There are certain steps that must be taken to stem this tide and secure the future food needs of humanity. A short-term measure would be to organise national awareness campaigns focusing on the impending food crisis and to push through legislation prohibiting or limiting to the barest minimum food wastage by government, businesses and individuals. In 2007 a campaign called 'love food, hate waste' was started to sensitise people to this issue, but more recently such action has died down. The single largest producer of food waste in the United Kingdom is the domestic household. Statistics show that in 2007, households were responsible for 6,700,000 tonnes of food waste – accounting for 19 per cent of all municipal solid waste. All this food which is being wasted could be saved to be used by those who are less fortunate. People must be made aware that although this might be a season of plenty, it will not last forever.

Furthermore, we must take food storage in general more seriously, not just in the short to medium term, but also in the long term. Although most countries already have a certain amount of food set aside to be released in cases of drought or other emergencies, we must begin to think about coordinating these efforts on a global scale. The international community must come together to tackle this problem, just as it formed a global compact to avoid the problems of

international war (in setting up the United Nations). A concerted effort is required because as individual units, some nations – especially smaller ones – are simply incapable of building such capacity.

All of these points go to show that in addition to climate change the world is facing yet another threat to its survival: the threat of starvation. In April 2008, the UN secretary-general, Ban Ki-Moon, brought the food crisis to the centre of the agenda. He established the High-Level Task Force on Food Security to come up with a concerted plan to fight the crisis and synchronise global responses. But in truth, the world is hardly prepared for what it is experiencing – groceries have become virtually unaffordable for many people, mostly in the developing world. African countries, in particular, are suffering because the majority of people's disposable incomes is already spent on food.

Looking into the future, unless we experience a new green revolution that is both more productive and more environmentally-friendly than the last one, there will be a major food crisis in the not-too-distant future. For now, even though the storm seems to have passed and food prices have become more stable, if serious measures are not taken, our fiesta could readily become a fiasco.

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# CARBON CAPTURE AND STORAGE

## BURY THE MYTH AND FOCUS ON ALTERNATIVES

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In theory, carbon capture and storage (CCS) mitigates the effects of climate change by pumping carbon dioxide underground. It proposes to reduce emissions without curbing the use of fossil fuels and, as a result, has been advocated by energy corporations, governments and international institutions. Much academic research also favours the idea. Criticism is often isolated and purely technical. However, surveys indicate that the public is either ambivalent towards CCS or has reservations about its use.

The public is right to be cautious: CCS is expensive, high risk, and may actually increase emissions due to greater demand for coal. These technical drawbacks alone suggest that the government's commitment to CCS does not add up. Cheaper and more reliable options exist, yet these rarely enter the debate. To overcome this, the concept of an 'energy hierarchy' can be used to highlight the full range of options for meeting climate change and energy security commitments. Criticism of CCS can therefore be seen as an opportunity to re-evaluate energy policy priorities and focus on the proven and economically prudent measures of energy conservation and efficiency.

### Introduction

Carbon capture and storage is not, as its name suggests, a single technology. It can be defined as the separation, transportation, and sequestration of CO<sub>2</sub> arising from burning fossil fuels. CCS is complex and requires expensive technologies, many of which come from the oil industry (figure 1).

In political debate the idea is grossly oversimplified. When he was secretary of state for energy and climate change, Chris Huhne frequently referred to CCS as a 'key technology' that was 'essential', yet showed little understanding of the many technologies involved.<sup>1</sup> This simplistic view seems to be shared: in the Hansard records 53 MPs have mentioned 'CCS technology' during recorded parliamentary debates yet only one, from Scotland, has referred to the underlying science.<sup>2</sup> If the technical risks are not understood, an overly optimistic assessment of CCS may be the result (Hansson 2009). Lack of scientific knowledge about CCS, such as the impacts on plant

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1 Hansard, Parliamentary answers to Malcolm Wicks, Annual Energy Statement, HC Deb, 23 November 2011, c305. Term tracked at <http://www.theyworkforyou.com>

2 Patrick Harvey quoted Ehlig-Economides and Economides (2010) to cast doubt on the capacity of pore spaces in rock to sequester CO<sub>2</sub> on the scale required. Hansard, Climate Change debate, Scottish Parliament, 18 March 2010, <http://www.theyworkforyou.com/sp/?gid=2010-03-18.24710.3>

efficiency and thereby rates of coal depletion, hinders informed debate on the subject. These things matter because they can result in the promotion of a technology that may not live up to its promise.

**Figure 1:**  
Key phases, processes and corresponding technologies in the CCS supply chain

Phase	Separate CO <sub>2</sub>	Transport	Sequestration	Site management
Processes <sup>a</sup>	Post combustion <sup>b</sup>	Compress waste gases <sup>d</sup>	Drilling	Above-ground site monitoring
	Pre-combustion	Pipeline construction <sup>e</sup>	Injection <sup>f</sup>	Below-ground site monitoring
	Oxyfuel combustion <sup>c</sup>	Pipeline operation		
	Amine-based solvents	Large compressors	Oil and gas drilling and enhanced oil recovery (EOR) technologies	3d seismic, time-lapse gravity, and satellite survey techniques
	Integrated gasification combined cycle (IGCC)	Steel pipelines <sup>g</sup> and fans from oil and gas industry	High chrome steel pipes <sup>h</sup>	Vertical seismic profiling, flow meters <sup>i</sup>

Notes: a) Forbes et al (2008); b) Wall (2007); c) Buhre et al (2005); d) compression energy costs are large, ~100 kWh/TCO<sub>2</sub> using a 31 MW centrifugal compressor (Koorneef et al 2008); e) pipelines were estimated to cost \$18m to \$102m per 100 km in China (Liu and Gallagher 2011); f) Michael et al (2010); g) Liu and Gallagher (2011); h) Pffennig and Kranzmann (2009); i) Michael et al (2010)

The public appears to be less optimistic than politicians: opinion polls indicate that attitudes toward CCS are largely ambivalent or mildly opposed.<sup>3</sup> Overall CCS has a low public profile.<sup>4</sup> This, together with the lack of scientific understanding amongst politicians, makes it timely to present the case against CCS in a straightforward and succinct way.

### The case against CCS

In a nutshell, CCS is expensive, risky, and may not reduce global greenhouse gas emissions. Even assuming minimal CO<sub>2</sub> leakage, the wider impacts include risk-laden and energy-intensive infrastructure and increased methane emissions. These issues are rarely stated in political debate.

These arguments are not widespread because existing criticisms of CCS often focus solely on one technological problem or legal difficulty. Few have confronted the idea directly and comprehensively<sup>5</sup> whilst providing viable alternatives. The condensed argument presented

3 See Tyndale Centre (2009): 'On first contact with the idea ... most people (48 ±7per cent) are neither for nor against. And a large amount (38 ±6.5 per cent) expressed slight or strong reservations.'

4 An international study found 'low levels of awareness, recognition or understanding of CCS' (Reiner et al 2005).

5 A notable exception is 'Carbon capture is turning out to be just another great green scam' (Monbiot 2008).

above combines five specific shortfalls: cost, risk, efficiency, viability and legality.

First, the economics of CCS do not add up. Estimated marginal abatement costs of hypothetical projects vary from \$31 to £300 per tonne of CO<sub>2</sub> (tCO<sub>2</sub>).<sup>6</sup> Few economic evaluations of actual CCS projects have been conducted. However, one study of a gas-fired power plant in Norway suggests costs greater than \$300 per tCO<sub>2</sub>: 'about 20 times the international carbon emission allowance price and many times higher than alternative domestic climate measures' (Osmundsen and Emhjellen 2010). The costs increase for retrofitted CCS plants (McKinsey 2007), which would dominate the UK market (DECC 2010). Aside from high capital and operation costs, the reliance of CCS plants on carbon credits may create incentives for the 'venting' of CO<sub>2</sub> if the price of carbon drops (Haszeldine 2009).

Second, CCS is a high-risk option. The technology has yet to be tested on the industrial scales required to make a dent in the UK's annual emissions. 'Slippage', where progress is hampered by continual setbacks, has been identified as a problem by the Committee on Climate Change. CCS may have limited capacity to help decarbonisation through the 2020s even assuming major projects such as Longannet had succeeded (CCC 2010). CCS plants take many years to construct even without the teething problems experienced by test plants (Russell and Markusson 2012).

Third, emission savings from CCS plants may be less than expected due to lifecycle impacts. These include carbon embodied in the manufacture of compressors, chemicals required to capture the CO<sub>2</sub>, and the reinforced steel pipelines needed to transport the CO<sub>2</sub> to suitable geological structures (IPCC 2005). Efficiency losses affect CCS plants (IEA et al 2010), resulting in coal-fired power plants requiring 24–40 per cent more fuel for the same amount of final energy output (IPCC 2005: table 8.3a). Because coal mining is associated with emissions of methane, this could lead to an *increase* in the total emissions of a potent greenhouse gas. This is also undesirable for energy security.<sup>7</sup>

Fourth, even assuming suitable geological formations exist nearby, ready to accept thousands of tonnes of compressed CO<sub>2</sub> each day, each of these issues above is severe. However, recent research casts doubt on the idea that geological formations are available to safely retain CO<sub>2</sub> on the scale required (Ehlig-Economides and Economides 2010, Shukla et al 2010).

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6 Costs have been estimated by a range of studies. These include estimates reported by the IPCC (2005): \$31 to 71 tCO<sub>2</sub> and DECC: £100-300/tCO<sub>2</sub> by 2050 (quoted in Harland et al 2010).

7 The UK's coal imports are double its production (Scrase and Watson 2009). Imports would increase if coal plants fitted with CCS became a major source of new electricity generating capacity, as proposed by the Committee on Climate Change (CCC 2010).



Finally, further impediments are related to the legal status of CO<sub>2</sub> deposits, insurance responsibilities, and the availability of low-cost fuel imports needed to power CCS-fitted power plants.

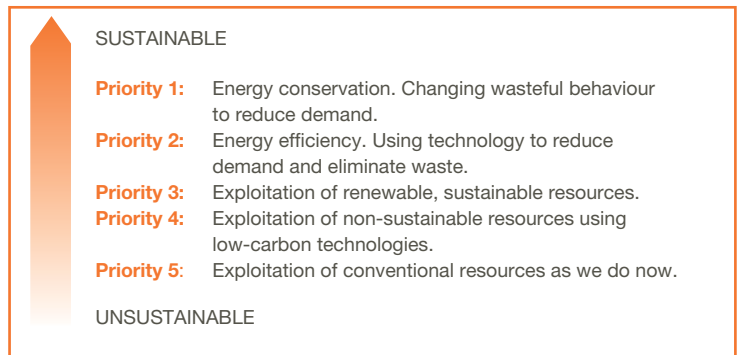
These considerations demonstrate that funding CCS is ill-advised. However, how facts are framed is often more important than the facts themselves in political debate (Lakoff 2004). For this reason, technical details should not overshadow the wider issues of morality, inequality, and energy-intensive lifestyles associated with CCS. Science should provide an objective foundation for informed discussion, not 'the final answer'. Any comprehensive debate on CCS should also include alternatives: setting aside CCS can usefully be seen as an opportunity to re-evaluate UK energy policy priorities.

### Alternatives

Given the large political investment in CCS, it should come as no surprise that politicians expect 'serious international and economic implications' if it fails (Nichols 2011). The recent collapse of the Longannet CCS scheme – backed by £1 billion of government money – led to soul-searching from corporate, political, and environmental commentators (Gersmann and Harvey 2011). Such pessimism is misplaced: a grim outlook for CCS does not mean a grim outlook for all climate and energy strategies. It can be seen as an opportunity.

The time and investment currently earmarked for CCS could be spent on alternatives, which perform better in terms of emissions, energy security, and the economy. A framework for joined-up thinking about energy policies and, crucially, for prioritising investment, is provided by the 'energy hierarchy' (figure 2).

**Figure 2:**  
The energy hierarchy,  
as advocated  
by the Institute  
of Mechanical  
Engineers



Source: ImechE 2009.

The energy hierarchy implies that a break from the existing (growth-centred) approach to energy policy is needed, based on a clear vision of a low-energy future (ImechE 2009). The framework accepts any conceivable energy policy, from CCS (which fits into priority 4) to carbon rationing (priority 1). It encourages all the options – technical and legislative – to be 'laid on the table' and considered together. It encourages diverse and mutually reinforcing measures to be pursued

in tandem, so a coherent energy strategy can be developed. As well as providing useful categories, the energy hierarchy arranges the available options in order. This is important in ensuring the most effective measures are prioritised. This differs from the thinking behind CCS and its focus on 'golden bullets'.

The mix of policies required to bring about a low carbon future in a socially acceptable way is open to debate. However, the government's botched support for CCS provides important lessons; policies should be based on evidence rather than rhetoric, on past experience rather than wishful thinking. The diversity of options raises the following questions: what would a comprehensive energy strategy, based on the energy hierarchy look like in practice? Which policies would be prioritised?

Many measures in priorities 1 and 2 of the energy hierarchy exist that are more cost-effective, reliable, and faster to implement than CCS. Priority 2 means simply improving the efficiency of buildings, vehicles and appliances. The resulting measures are likely to be attractive politically because they require no change in behaviour. Options include improved regulation of the energy performance of buildings by strengthening implementation of the EU's energy certificate, offering very low marginal costs or negative abatement costs (Boardman 2007) and furthering the use of vehicle emissions bands to discourage 'gas guzzlers' (Ryan et al 2009).

Priority 1 measures cost even less to implement because they require no change to existing technology. Energy conservation implies a change in behaviour and may therefore be seen as more risky politically. Energy rationing has the potential to reduce emissions rapidly in a socially equitable way (Fleming and Chamberlin 2011). More modest legislative changes encouraging energy conservation include fiscally neutral modifications to farming subsidies (Harvey 2008) and rising block energy tariffs (CCC 2009).

These options may not be as grand as CCS, but offer better value for money and can work in synergy. Insulation combined with policies to penalise energy waste is a good example (Boardman 2007), with very low or negative abatement costs. Various insulation measures, including insulated doors, windows and lofts, are associated with negative abatement costs: they pay for themselves (DECC 2011).

A major advantage of 'demand side' measures is that they make 'supply side' solutions easier to implement, due to lower energy use (Mackay 2009). Conservation measures to promote more flexible electricity demand, for example, would aid the integration of renewables into the National Grid (Bouffard and Kirschen 2008). Reducing energy wastage – in parallel with efficiency and improved supply-side technology – is a central tenet of the energy hierarchy, and in this sense it follows the waste hierarchy. By illustrating the full range of options the energy hierarchy also encourages finding the best value for money. For example, the £1 billion saved through the collapse of the Longannet

CCS scheme could be used to restructure electricity tariffs, so that they penalise waste whilst reducing levels of fuel poverty (Boardman 2010).

The energy hierarchy encourages a wide perspective. Including energy policy within a wider remit of taxes, well-being and equality has a huge potential to produce win-win scenarios. Improved health and emissions outcomes due to cycling policy (Woodcock et al 2007) and aforementioned fuel poverty policies are just a couple of examples. Such measures are 'low-hanging fruit' that can be implemented rapidly at comparatively little cost. They should be prioritised, especially in these times of fiscal contraction.

## Conclusion

The energy hierarchy approach to energy policy can meet the aim of CCS (reduced greenhouse gas emissions) with lower risks and at a lower cost. Energy conservation and efficiency measures tackle associated problems of resource depletion, energy security and recession: these are issues that CCS could make worse. This is the advantage of treating the problem – our inability to stop burning fossil fuels – at its root. Rather than relying solely on 'techno-fixes' such as CCS or geo-engineering to tackle emissions, the energy hierarchy places CCS in its wider context and considers the demand side. The energy hierarchy encourages the selection of options that are cost-effective, simple, and fast to implement.

The energy hierarchy does not, however, encourage a focus on 'golden bullets'. A range of measures, from regulation of light bulbs to research into fusion, must be pursued in parallel to tackle the energy/climate problem in the long term; research into carbon sequestration options can be part of the mix. However, the current government strategy, which uncritically assumes that CCS *will* work based on scarce evidence and subsequently diverts public money and attention into large and risky schemes, amounts to placing the nation's future energy options in one weak basket. For a sure energy future, policymakers should take heed of the evidence and prioritise conservation, efficiency, renewables, and only lastly research into riskier options such as CCS.

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# THE BATTLE FOR THE AIR

## IS EMISSIONS TRADING THE BEST POLICY INSTRUMENT TO AVERT GLOBAL WARMING?

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Climate change has been described as the greatest collective action problem the world has ever faced (Barrett 2008: 257). In the search for regulatory solutions which would mitigate the effects of global warming, emissions trading has become the most favoured policy instrument. This article interrogates some of the most important claims to avert the repercussions of man-made climate change and deliver much-needed greenhouse gas (GHG) reduction put forward by proponents of emissions trading. It will do so by analysing the effectiveness of the European Union's Emissions Trading Scheme (EU ETS) in terms of emissions reduction (through the newly created commodity of carbon credits) while incorporating this in a broader discussion of market-based environmentalism. If we are to envisage a more sustainable future and a transition away from today's fossil-fuelled economies, it is imperative that we seek to understand the EU emissions market in terms of its aims, and propose ways to overcome its current failures.

### How the EU ETS works

The central point of the Kyoto Protocol was to establish a global market in GHG emissions by means of three flexible mechanisms:

1. emissions allowance trading between registered polluters
2. the clean development mechanism enabling offset trading in the form of emissions credits between Annex 1<sup>1</sup> countries and developing countries
3. joint implementation allowing high-polluting Annex 1 countries to invest in mitigation projects in transition economies, such as Eastern Europe.

Taken together, these were intended to deliver effectiveness (real GHG emissions decrease), efficiency (low-cost solutions for individual polluters) and equity (cash and technology transfer from the industrialised world to the rest).

The EU ETS is currently the largest market in emissions trading. States propose levels of permitted pollution and the European Commission negotiates around these levels before allocating permits. Since the EU is registered under the Kyoto Protocol as a single 'country', there is a 'bubble agreement' whereby allowances vary to reflect different national circumstances in industrial output, with some countries receiving a surplus of allowances and others a deficit. Tightening the cap of permitted levels of GHG emissions renders pollution more costly, with

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1 Annex 1 countries are defined as industrialised countries and those in transition to industrialisation.

the intention of pushing industry to a transition away from fossil fuels and towards investment into cleaner technologies. To ensure 'least cost compliance', directive 2004/101/EC creates the conditions for member states to use credits generated by emissions reduction projects within the ETS market. The pilot, phase I, ran from 2004–2007, followed by phase II in 2008–2012 (coinciding with the Kyoto commitment period). The ETS draws its model from the apparently successful US cap-and-trade scheme for sulphur dioxide in the 1990s (Castree 2009).

One of the most contentious points in the ETS model was the initial allocation of allowances set in directive 2003/87/EC. This stated that 95 per cent of allowances in phase I and 90 per cent in phase II would be given for free to industrial polluters. Although various governments initially advocated 'benchmarking' as the principle of allocation, ultimately 'grandfathering' was favoured in the majority of the national allocation plans. Grandfathering is a method of allocation based on installations' historical emissions shares according to their sector, whereas in benchmarking some index of historical activity or capacity is multiplied by a uniform emissions-rate standard to determine allocations to individual installations (Ellerman and Buchner 2007: 78). However, debate rages over each method of allocation and its subsequent effects on the market's economic efficiency. For example, it is thought that grandfathering favours big industrial polluters, undermining the 'polluters pay' rule whilst failing to encourage investment in clean technologies through adequate incentives. This could, in turn, undermine the efficiency and overall effectiveness of the trading scheme as it may not ensure GHG reduction according to the least-cost principle (Chernyavs'ka 2008: 15).

The free allocation of allowances for industrial polluters has been described as the largest instance of the creation and regressive distribution of property rights in history (Gilbertson and Reyes 2009: 10). As the opportunity cost of allowances is incorporated into power prices in countries with liberalised energy markets, the largely free allocation of allowances means that power generators receive a windfall profit since their compliance costs are far less than their revenues generated from increased consumer prices. When the overall loose cap, which in most cases exceeds overall emissions, is taken into account, the scheme primarily translates into profit-making opportunities for industrial polluters. While most allowances are used for covering existing emissions, the cost of buying extra pollution permits is being passed to consumers, effectively bypassing any incentive for systemic change (Lohman 2006: 90). For example, the Czech energy giant CEZ, which received a third of the country's permits, was able to sell its allowances in 2005 when the price was high and buy them back when the market collapsed – investing the profit in coal production while energy prices for consumers increased. In the UK, the 'big six' electricity generators receive around \$1.2 billion each year in windfall profits from the ETS. The industry is able to pass the marginal costs onto consumers, giving a massive boost to the industry's profitability (Lohman 2006: 91). Moreover, according to the

European Environment Agency,<sup>1</sup> there was an increase of 2.8 per cent in CO<sub>2</sub> emissions in the EU 27 in 2010 from energy production-related fossil fuel combustion.

### **Institutional learning curve or regulatory deadlock?**

So far there has been a wide gap between environmental rhetoric and reality in the EU ETS. Stemming from the divorce between economic theory and complex reality, the current regulatory framework and the market design of the EU ETS have faced serious shortcomings (Spash 2010). Some argue that carbon markets like the EU ETS, which were advertised as a means for incentivising and providing finance for a transition to a fossil fuel free future by the derivatives traders and neoclassical economists who created them, have had exactly the opposite effect (Lohman 2009: 1073). In their decade of existence, these markets have offered new means for the heaviest polluters in fossil-based industries to delay structural change while also providing supplementary finance for these industries. As investment is used interchangeably as a short-term, money-making venture and as a foundation for a secure future, the 'savings' of the carbon trading market are achieved by putting off technological change and long-term investment in a future without fossil fuels. Thus, by encouraging ingenuity in inventing measurable equivalences between different types of emissions and various types of offsets rather than by fostering innovation to reduce dependence on fossil fuels, the overall effectiveness of this type of market-based environmental policy is questionable (Lohman 2006).

The latest report of Carbon Trade Watch (2012) indicates that although the currently low market value of carbon has led the general public to believe that the EU ETS is not working, it is not the market as such that has failed but rather the policy framework. We must go back to the initial aims of the policy to assess this claim. Who has profited most? Did the regulatory framework succeed in circumventing what the market was initially created for, that is, achieving emissions reduction in the most cost-effective way?

While the 'free market environmentalism' theory – which holds that carbon trading is efficient in internalising the costs of environmental externalities (Castree 2009: 199) – has some validity when judged against the success of the US cap-and-trade of sulphur dioxide, there is an enormous gap between environmental theory and practice in the EU (Castree 2009: 203). Whether the problems associated with the EU ETS are inevitable features of institutional learning or are due to drivers outside of policymakers' control (such as oil prices), it might be the case that these are all inherent problems in the business-friendly approach of most EU states. The text of directive 2003/87/EC is easily interpreted as a compromise between the urgency to meet targets set out in the Kyoto Protocol and the interests of the different member states – and thus the big capital interests behind them. Ultimately,

1 European Environment Agency (2011), 'Why Did Greenhouse Gas Emissions Increase in the EU in 2010?' EEA analysis in brief, 2011. Available at [www.eea.europa.eu](http://www.eea.europa.eu)

the intricacies and range of interpretations outlined above resulted because of the failure of the Kyoto Protocol to stipulate a degree of uniformity in rules of allocation, caps to be set for each member state and the methodology for constructing national allocation plans (Chernyavs'ka 2008: 17).

In an effort to reconcile the regional logic of emissions trading with its regulatory logic, complex struggles and negotiations between EU policymakers, member states and industry have taken place (Bailey and Maresh 2009: 7). The market mechanism per se is not the problem but rather the regulatory deadlock in which the market seems to be trapped thanks to European policymakers' unwillingness to put pressure on the big fossil-fuelled industries for the sake of a more coherent and effective scheme which would diminish corporate influence over the design of the carbon market. The form of carbon capitalism which has emerged has been driven by the interests of the big industrial polluters. As such, the EU ETS has bowed to corporate self-interest from the very beginning. Some would argue that even the most conservative estimates of the windfall profits enjoyed by intensive fossil-fuelled industries at the launch of the carbon market raise a question mark over the political accountability of the EU ETS (Sijm et al 2008: 123). Structural deficiencies have been perpetuated in phase II, with the issue of windfall profits remaining unaddressed in the European Commission's directive, the overall cap set only marginally lower and grandfathering remaining the practice although policymakers are well aware of its associated drawbacks after the disastrous effects of the phase I pilot (Castree 2009: 204).

Both market environmentalists and climate justice movements are calling for systemic change. The latter, comprising organisations such as Climate Justice Action, Climate Justice Now! and Third World Network, campaign for equitable environmental policy but are increasingly criticised over their apparent misinterpretation of cap-and-trade schemes and faulty economic analysis (Hahnel 2012: 142). Market environmentalists on the other hand suggest that only a 'learning by doing' approach will deliver much-needed GHG reduction – both in terms of economic efficiency and equity. They reiterate the need for improved cap-and-trade schemes, whereas climate justice movements are warier of emissions trading and call for a rapid transition away from fossil fuels.

Advocates of current ETS models regard GHG control as a 'pro-growth strategy' offering positive financial returns for investors. One such example is to be found in the Stern Review (2006), which emphasises the great opportunities for banks and the financial sector in funding pollution reduction. But if we consider pollution control as defensive expenditure we could argue that this adds nothing to human welfare and should not be a sign of societal progress. The transaction costs inherent in these markets should not be interpreted as a source of economic growth but rather a loss to society (Spash 2010: 16).



## Conclusion

Intense corporate lobbying against governments' favoured idea of a carbon tax and the desire of the EU to fill a power vacuum after the US withdrew from the Kyoto Protocol in 2001 saw the EU making a U-turn and adopting a cap-and-trade policy. Subsequently, the EU enjoyed a leading role in climate change negotiations while its proposed emissions trading scheme increasingly attracted attention as a model for a global cap-and-trade system. But concerns about the practical implementation and effectiveness of the current scheme, the failure of the US (the world's largest per capita emitter of GHG) to establish a national cap-and-trade programme and the fundamental ethical critique of the legitimacy of carbon commodification indicate that the future of emissions trading is far from certain (Perdan and Azapagic 2011: 6052-6053). With little incentive for investing in clean technologies, a timely transition away from fossil fuels seems unlikely. With the market-based policy tool of emissions trading preferred on grounds of economic efficiency (although this is subject to debate), environmental policy will not address the challenge of behavioural change while the goal remains to seek new investment and financial opportunities (packed in green discourse and delivered to the public in the form of pro-growth strategies). Structural deficiencies in the EU ETS cannot be understood as part of an institutional learning process so long as the EU policymakers remain unwilling to learn from its failures.

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# DEVELOPMENT AND THE ENVIRONMENT: A NECESSARY TRADE-OFF?

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**‘Earth provides enough to satisfy every man’s need,  
but not every man’s greed’**

Mahatma Gandhi

The paths of environmental sustainability and economic development are inevitably divergent. For all nations to emulate the western industrial model, the resources of four planets would be required (Payne and Phillips 2010). Theories of modernisation and dependency can therefore only contest how best to implement an unsustainable model (Greig et al 2007). This modern day trade-off can be traced back to the belief that economic growth is vital not only for development, but also for sustaining developed economies. Overconsumption in the developed world has, in turn, established a second barrier to ecologically supportable development. This needn’t be the case: a move towards zero-growth economies offers a solution. The first step in this colossal task must be to redefine how we measure development.

## **The current trade-off**

Today, the wealthiest 20 per cent of the world’s people consume 80 per cent of the world’s non-renewable resources. Furthermore, just 16 per cent of the world’s population produce over 50 per cent of the world’s greenhouse gases (Greig et al 2007). Even at present levels, this model is evidently unsustainable, with a temperature rise of 3.5°C predicted by 2100 (CAT 2012). If the existing developed economies are not sustainable, then emulation by emerging economies will spell disaster for the environment. Comparing the carbon output of emerging markets with that of developed nations provides a sobering insight into the problem. In 2007, China overtook the US as the world’s biggest producer of carbon emissions (Guardian 2007). Nevertheless, the US’s output per capita is almost three times that of China. India comes third in the total output table, but its individual citizens are responsible for only 10 per cent of what their American counterparts produce (Data-Blog 2012).

If Indian and Chinese citizens consumed at the same levels as Americans, global carbon output would rapidly become unupportable. It is not just in emissions that a trade-off is made: as the population increases and pressure grows on resources such as food, land, water and fuel, global resources are being squeezed from all sides. The Stockholm Resilience Centre (2009) identifies nine global

boundaries within which we, as a species, must operate if we are to bequeath survivable conditions to future generations.

- climate change
- stratospheric ozone
- land use change
- freshwater use
- biological diversity
- ocean acidification
- nitrogen and phosphorus inputs to the biosphere and oceans
- aerosol loading
- chemical pollution

The study suggests that three of these boundaries have already been transgressed (climate change, biodiversity and nitrogen inputs); in addition, the researchers determined that crossing of one or more of these boundaries may compromise the ability of the other boundaries to hold firm. In other words, once one boundary has been crossed, less effort is required to cross another (Steffen et al 2011).

### **The neoliberal approach: development first**

The dominant neoliberal argument states that countries cannot consider, let alone prioritise the environment until they reach a certain level of development. Poverty constrains the environmental options available to developing nations. Only once a nation is materially and technologically wealthy can it afford to take account of the environment (Greig et al 2007). Neoliberals advocate a short-term trade-off in favour of development: environmental protection will be left to the long term, after industrialisation has run its course. This view is incompatible with the data previously presented: focusing exclusively on economic growth would wreak environmental havoc in the long term (IPCC 2011).

Ironically, the trade-off between development and sustainability is not in itself sustainable. The UN warns that 'in many parts of the developing world, environmental degradation already places a binding constraint on development' (UNMP 2005). Moreover, the Economics of Ecosystems and Biodiversity Review predicts that current rates of ecological decline will lead to a 7 per cent reduction in global GDP by 2050 (BBC 2008). The problem is compounded by the fact that trade globalisation increases environmental costs through transportation and distribution. Clearly, this is not a sustainable economic paradigm; a new framework must be formulated.

### **Redefining development**

Western-style development will catastrophically degrade environmental conditions. It is imperative, therefore, that we redefine the term 'developed'. The highest stage of development, after taking into account the environment, can no longer be seen simply as an age of mass consumption, as suggested by Rostow (1960).

Developmental theorists have tussled over how best to reach this final stage, but none – with the exception of post-development theorists – have sought to question the actual purpose and value of ‘development’ (Payne and Phillips 2010). In order to create a sustainable development model, it is necessary to sever the perceived ties between constant economic growth and a high quality of life. The New Economics Foundation (NEF 2009) shows that when we consider the environment as part of countries’ development credentials, rankings of development based on mainstream indicators are turned on their head. The US, for example, is placed 114<sup>th</sup> and the UK 74<sup>th</sup>. NEF’s Happy Planet Index (HPI) shows that a large ecological footprint is not a prerequisite for a greater quality of life. Costa Ricans, on average, live a year longer than Americans and report higher life satisfaction; their nation’s per capita ecological footprint, however, is less than a quarter the size of that of the US. If development were measured according to real well-being, rather than quantified in monetary terms, then there wouldn’t be a need for a trade-off between prosperity and sustainability.

### **The (unnecessary) problem of overconsumption**

The problem of overconsumption in developed nations is one of the largest barriers to sustainable living. The countries that perform best on the HPI are overwhelmingly middle-income countries. Those that score in the median range under the UN Human Development Index (HDI) tend to score highly under the HPI. These countries are far more ecologically efficient at creating well-being than the countries seen as the most highly developed by GDP-based measures. The illusory relationship between increased consumption, which is reliant on economic growth, and higher well-being can be revealed by comparing Malaysia with wealthy Singapore. Both countries report similar levels of life expectancy – around 54 years – but Malaysians perform better on the well-being front (NEF 2009). When comparing their HDIs, Singapore ranks only marginally higher in education (UNDP) despite its ecological footprint being more than double that of Malaysia (NEF 2009). This comparison is especially useful, as it cannot easily be explained via cultural factors. Evidence from countries currently defined as ‘highly developed’ further support this trend. In the UK, economic output has doubled since 1970, but average well-being has remained the same (Easterlin 1995). The conclusion must be that, beyond a certain level, increased consumption does not automatically improve a country’s well-being.

### **Ending the cult of GDP**

Developing nations’ focus on economic yardsticks like GDP and consumption encourages short-term decision-making. Whilst improving these nations’ economic report cards, neoliberal development targets heighten the chances of long-term negative environmental consequences without any tangible increase in the well-being of their citizens. The international trade in waste is a prime example of how low-income countries are tempted to accept environmental degradation in exchange for an improved balance

of trade. Such transactions epitomise the myopia of neoliberal development theory: poorer countries do not account for the full environmental costs of taking on this waste, allowing developed nations to exploit developing ones by avoiding the negative externalities associated with pollution. Despite the environmental costs, these transfers increase poorer nations' GNP (Greig et al 2007). Furthermore, the displacement of waste from high-consumption areas desensitises the issue of sustainable resource management for those living in richer nations, pushing it down the political agenda. By moving away from a fixation on GDP as a measure of development, low-income countries will begin to take decisions that account for long-term environmental sustainability.

### **A new way of doing economics**

This paper has highlighted some of the key issues in reconciling development and the environment. Any model of sustainable development must be founded upon the realisation that overconsumption in the developed world and elsewhere is not only ecologically unsustainable, but also unnecessary. Beyond a certain threshold, higher incomes and constant growth do not improve the well-being of citizens. Governments of developed economies should implement policies that prioritise well-being over economic growth. Research by Easterlin (1995) has shown that increased wealth does not equate to increased well-being. In the context of the Washington Consensus and its ten neoliberal commandments, the iconoclastic decision to voluntarily decelerate economic growth will be met with strong resistance. Consequently, the government should establish an evidence base for the purpose of empirically reinforcing its arguments. It could start by commissioning independent studies of the relationships between income, well-being and the environment. This way, the government could make a legitimate claim to be acting in the interests of the people, and thereby secure a democratic mandate for its new, far-sighted policies.

Critics of GDP as the key measure of development have long pointed towards its inadequacies. It has survived largely thanks to a lack of viable alternatives. The challenge is to create alternative measures of development that centre on observable well-being and ecological efficiency. This is the compass that should guide policymakers if we are to make development sustainable.

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# ECONOMIC GROWTH OR THE ENVIRONMENT?

## BOTH: SUSTAINABLE CAPITALISM

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The unprecedented systemic risk threatening the global financial system since the crash in 2007 has muted the urgency of the need for multilateral action on tackling climate change. The necessity of immediate action, however, has not subsided. Lord Stern (2009) argues that to ensure a mere fifty-fifty chance of global temperatures rising by 2°C – above which environmental consequences are considered ‘dangerous’ by scientists – CO<sub>2</sub> emissions must be maintained at 400ppm. At current growth rates of CO<sub>2</sub> emissions we will hit 450ppm by 2015 (Stern 2009). To hold temperature rises to 2°C, it is necessary for global investment in clean energy to reach \$500 billion per annum by 2020 (World Economic Forum 2011). Despite the bleak economic situation, there has been a 30 per cent rise in global clean energy investment to a record \$243 billion per annum – however, this is still below half the required annual investment.

The perception that the recession recently experienced in developed countries has been a hangover from years of growth and prosperity is deceptive. From 2000 to 2010, median income in the US declined by 7 per cent after adjusting for inflation, marking the worst ten-year performance on record (DeNavas-Walt et al 2011). The discourse on the threat of climate change is often presented as a zero-sum choice between economic growth and the environment (Porritt 2005). The view that economic development and sustainability are mutually exclusive has distorted the debate. Sustainability and long-term wealth creation are intrinsically linked. Businesses and markets do not operate independently of society or the environment. There is an alternative that can provide tangible and sustainable economic growth – a more stable capitalism, which factors in the environment and avoids the boom-and-bust cycle of our current form of capitalism (Blood 2010).

Today, short-termism in our economic system has resulted in instability, inequality and austerity, as well as a failure to step up to the economic challenge of climate change mitigation. As Herman Daly points out, short-termism is driving our economies and our planet into liquidation (Generation 2012). Sustainable capitalism provides an alternative. It does not represent a trade-off with profit maximisation, but actually stimulates long-term value creation through refining markets to address real needs whilst integrating environmental, social and governance metrics that consider all costs and stakeholders throughout the decision-making process (Blood and Gore 2011, Generation 2012).

### **'Long on short and short on long'**

The 'long on short, short on long' nature of modern-day markets has a major impact on the decision-making process of businesses (Oppenheim and Mendonca 2007). For example, the average holding period for a New York Stock Exchange stock is now less than six months, down from five to six years in the 1970s, two to three years in the 1980s and one to two years in the 1990s (Montier 2007). A survey by the National Bureau of Economic Research found that 78 per cent of executives would forgo economic value in exchange for smooth earnings. The same survey found that 55 per cent of managers would forgo an investment that offered positive returns if it meant missing quarterly earnings targets (Graham et al 2005). This behaviour is cultivated by the ruthless market reaction to volatile earnings or a missed earnings target, as investors and analysts alike rue such perceived uncertainty (Graham et al 2005). This may result in a failure to make the necessary strategic investments required for long-term profitability. Such a short-term approach can result in a negative externality being imposed on the stakeholder; indeed, short-termism largely prevents extensive stakeholder engagement in the first place (Lavery 1996).

The focus on quarterly results by the financial markets and lack of credit for long-term value-creation targets has frustrated business executives (Davis 2005) and yet, there is widespread consensus in corporate finance that 75 per cent or more of the value of a business lies in its long-term cash flows (Morin and Jarrell 2001, Burgman et al 2007). Alongside this, 84 per cent of executives think large corporations should contribute to the broader public good as well as generate high returns for investors (McKinsey 2006). The same executives, however, viewed engagement with a corporate social contract as a risk, not an opportunity. The emphasis on short-termism is entrenched in our business culture; consequently, the costs imposed on the environment are almost never factored in.

### **Sustainability and long-term value creation: mutually inclusive**

The view that sustainability is fundamental to long-term value creation is supported by a recent study into 'The Impact of a Corporate Culture of Sustainability on Corporate Behaviour and Performance'. It analysed a sample of 180 companies over 18 years to investigate the effects of a corporate culture of sustainability on their performance (Eccles et al 2011). A firm categorised as 'high sustainability' was one in which the board of directors was responsible for sustainability, organised procedures for stakeholder engagement were more likely to exist, business strategies were more long-term oriented, and executive pay incentives were centred on sustainability. Firms which adopted very few of these policies were classified as 'low sustainability'. The study found that 'high sustainability' firms vastly outperformed 'low sustainability' firms in terms of both stock market performance and accounting measures, though only in the long-term. Moreover, it found that the 'high sustainability' companies outperformed 'low sustainability' firms most markedly in sectors where



customers were individuals rather than firms, where competition centred around brand and reputation, and where their products depended on the extraction of natural resources (Eccles et al 2011).

Furthermore, another recent study analysed the impact of corporate environmental management on credit risk based on the environmental profile of 582 US public companies between 1995 and 2006 (Hann and Bauer 2010). It concluded that companies about which there are environmental concerns pay a higher premium in the cost of debt financing and have lower credit ratings. Companies which executed proactive environmental policies, however, were found to have higher credit ratings and were able to borrow at a lower cost. In particular, the study found that a firm which supplied 'innovative products and services' with environmental benefits, and displayed clear efforts to contribute towards climate change mitigation, often had lower bond spreads (Hann and Bauer 2010).

Even if the private sector embraces a more sustainable version of capitalism, it is far from certain that this will be enough to make the shift to a low-carbon global economy. The market for energy, in its current form, fails to incorporate crucial variables that would incentivise investment in renewable energy, and thereby replace the use of carbon-intensive energy (Gore 2009). Currently, there exists no low-carbon technology for supplying energy which has lower 'expected costs' than those of the fossil fuel equivalent it would replace (Anderson 2007). Wind, for example, is only competitive with oil at approximately \$150 per barrel – a price far above even today's record oil prices (Stern 2009). The Stern Review (2006) proposes that a clear carbon price is the most effective way to encourage investment in alternative low-carbon technologies.

Encouragingly, the UK government announced a carbon price floor in 2011 of £16 per tonne of CO<sub>2</sub> from 2013, rising to £30 per tonne in 2020 (HM Treasury 2011). However, this falls well short of the suggested aim of an upper-end carbon price of £100-200 per tonne, if substitution to low carbon technologies is to be incentivised (Stern 2006 and Anderson 2007). Anderson (2007) claims that a carbon price of £100 per tonne of CO<sub>2</sub> would only add 0.6 pence per kWh to the price of gas-fired electricity generation, and 7 pence per litre of petrol and diesel fuels, which 'in neither case [would] be sufficient to encourage substitution on the scale required'.

### **The path to sustainable capitalism**

The UK's current economic model is not geared towards the long-term strategy required for a transition towards a clean economy. Ingrained in UK businesses is the preference for short-term performance over long-term value creation. It is a behavioural as well as a structural problem, with financial markets incentivising such conduct. The firms that do integrate sustainability into their decision-making see profit gains as a consequence. The path to sustainable

capitalism will require the removal of the barriers to the rational switch to long-termism.

The first step would be to change the behaviour of UK management in order to foster sustainable business practices. Pay and reward should be linked to fundamental drivers of long-term value creation, which would hold executives more accountable to their decisions over the long term. Furthermore, financial rewards should be spread out over rolling multi-year periods (Blood and Gore 2011). Companies should have to integrate a report of their environmental record along with their financial performance so that investors can make a comprehensive evaluation of the business. To incentivise long-term investment and greater stakeholder engagement, tax breaks should be provided for investors that hold on to securities for long periods. The failure of the markets to internalise the costs of CO<sub>2</sub> emissions needs to be addressed via a carbon price: this will incentivise investment in renewable energy at a rate which would successfully mitigate 'dangerous' climate change.

Sustainable capitalism does not only require change in the management and priorities of the private sector: it demands an effort by governments to build a regulatory framework which will enhance the private sector's incentives to shift towards a focus on the long term.

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