Open pit mining at Jaenschwalde, Germany. Photo: Christian Mang/Greenpeace

FOOD, FOSSIL FUELS AND FILTHY FINANCE

EMBARGOED UNTIL 00:01 HRS GMT 17 OCTOBER 2014

Climate change is already making people hungry, and the use of fossil fuels is largely to blame, representing the single biggest source of greenhouse gas emissions globally. On current trends, the world will be 4–6ºC hotter by the end of the century, exceeding 2ºC within the lifetimes of most people reading this report. This will cause untold human devastation and exacerbate poverty and hunger. Despite some steps in the right direction to tackle climate change, a 'toxic triangle' of political inertia, financial short-termism and vested fossil fuel interests blocks the transition that is needed. To help break this, governments must commit to phase out fossil fuel emissions by early in the second half of this century, with rich countries leading the way.

SUMMARY

The world produces enough food to feed everyone. But every day more than 800 million people go to bed hungry. This is a scandal – and climate change is set to make things even worse.

Without change in the global use of fossil fuels, there is a serious risk that the world is on track for a 4–6 degree temperature rise by the end of the century, exceeding even the 'worst case scenarios' outlined by the IPCC.

Fossil fuels are the single biggest driver of climate change; if the world is to avoid exceeding dangerous global warming of 2°C, up to 80 percent of known fossil fuel reserves need to stay in the ground.[1] In the absence of an unprecedented change in the global use of fossil fuels, there is a serious risk that the world is on track for a 4–6 degree temperature rise by the end of the century, exceeding even the 'worst case scenarios' outlined by the Intergovernmental Panel on Climate Change (IPCC).[2] This could put up to 400 million people across some of the poorest countries at risk of severe food and water shortages by the middle of the century,[3] with 25 million more malnourished children – the equivalent of all of the under-fives in the USA and Canada combined.[4] It also poses major economic and business risks as the impacts of climate change start to be felt across rich and poor countries alike – damaging property, limiting agricultural production and reducing labour productivity. Unilever has said that it loses €300m ($415m) each year due to extreme weather events such as flooding and extreme cold.[5] Continued demand for fossil fuels will also be accompanied by increasing – and costly – impacts on health and local communities.

Unilever has said that it loses €300m ($415m) each year due to extreme weather events such as flooding and extreme cold.

Avoiding these devastating impacts means a rapid and urgent transition to low-carbon economies globally. Governments around the world are beginning to wake up to this reality – President Obama recently announced new rules to cut emissions from power plants by 30 percent by 2030; the European Union is currently negotiating a 'climate and energy package' with new emission reductions targets for 2030; China has recently hinted at 'absolute carbon caps' after 2016. These are positive steps in the right direction, but they fall far short of what is needed – especially from rich and historically high-emitting countries which have the greatest capacity to act, and which must demonstrate far greater ambition if developing countries are to follow suit.[6] Recent moves by large historic emitters including Canada, Russia, Japan and Australia to renege on existing commitments and to embrace the dirtiest and riskiest of fossil fuels – from coal to tar sands and fracking – send all the wrong signals to the rest of the world. And while higher emitting developing countries cannot be held to the same bar as rich nations, long-term carbon-intensive development is also incompatible with keeping global warming below 2°C and risks locking these countries into an over-reliance on fossil fuels.

The next decade will see over $6 trillion allocated to developing the fossil fuel industry at the current rate of capital expenditure. In 2012 fossil fuel companies spent $674bn on exploration and development projects.

In the absence of robust climate legislation, finance continues to flow unabated into the fossil fuel industry. At the current rate of capital expenditure, the next decade will see over $6 trillion allocated to developing the fossil fuel industry.[7] In 2012 alone, fossil fuel companies spent $674bn on exploration and development projects.[8] This private finance is facilitated by public finance, incentives and tax breaks – with an estimated $1.9 trillion of subsidies oiling the wheels of the fossil fuel sector

globally every year, including the costs of paying for its widespread damage.[9] In this context, fossil fuel interests therefore spend millions of dollars every year lobbying to defend their bottom line, given that they have so much to lose from ambitious climate regulation. In 2013, fossil fuel industries spent an estimated $213m lobbying US and EU decision makers – well in excess of half a million dollars every day and totalling $4m a week. In the US alone, the estimated yearly bill for lobbying activities by fossil fuel interests amounts to $160m – the same amount that the government in Nepal has estimated is needed for crucial adaptation actions that currently remain unfunded.

$160m is the estimated yearly bill for lobbying activities by fossil fuel interests in the US – the same amount that the government in Nepal estimates is needed for crucial climate change.

This 'toxic triangle' of political inertia, financial short-termism and vested fossil fuel interests stands in the way of the transition needed. The lack of necessary government ambition to shift away from fossil fuels results in continued investment by the global financial sector based on an assumption that fossil fuels are here to stay – buoyed by the rhetoric of the fossil fuel industry itself. This is despite the fact that a low-carbon future is both desirable and possible, North and South, with sustainable low-carbon technologies rapidly decreasing in cost and beginning to compete with dirty energy. Decentralized sustainable renewable energy also offers significant opportunities to provide more suitable and less costly energy access for the poorest and most marginalized communities. Governments globally could tip the balance in favour of a low-carbon future and send the right signals to unleash the finance for this transition through committing to phase out fossil fuel emissions by early in the second half of this century.

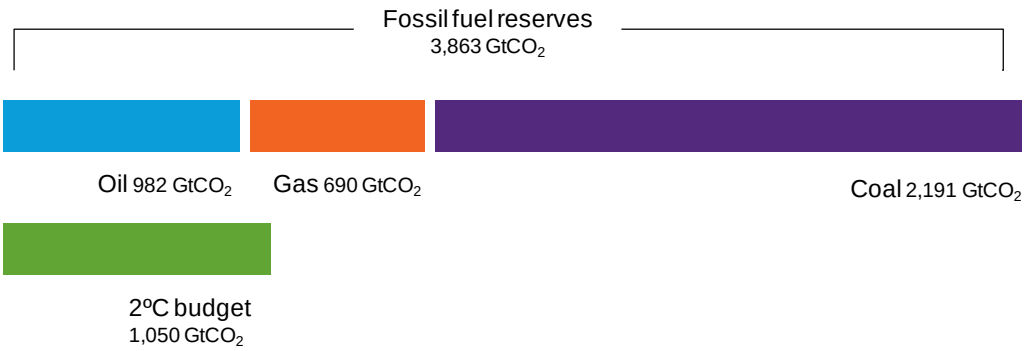
Rich countries can and must act first and fastest, urgently transitioning their economies away from fossil fuels due to their historic responsibility for climate change and their greater capacity to act. This in turn, alongside provision of international climate finance where appropriate, will help to unlock the necessary ambition from richer developing countries with rapidly increasing emissions which are currently heavily investing in fossil fuels and will also need to move concertedly towards low-carbon pathways in the coming decade if warming is to stay below 2°C. As their economies grow they will have increasing capacity to make these investments, building on the positive moves they have already made in this direction.

Poorer developing countries – whose contribution to climate change is often negligible and whose capacity to transition is lower – will inevitably have to move more slowly, especially as fossil fuels can play an important role in immediate social and economic needs. Where possible, these countries should also start to seize the low-carbon opportunities that do exist – and the benefits of which in some cases surpass fossil fuels – and rich nations should support them with public funds.

1 FOSSIL FUELS, HUNGER AND CLIMATE CHANGE

Emissions from the extraction and use of fossil fuels are the single biggest driver of climate change, which is already devastating livelihoods and making poor people hungry. Fossil fuel usage across sectors accounts for over 80 percent of global carbon dioxide emissions, and 65 percent of all greenhouse gas emissions. In 2012, coal burning was responsible for 43 percent of total global $C0_2$ emissions from fuel combustion, with oil, gas and gas flaring accounting for 33, 18, and 0.6 percent, respectively.[10] According to the IPCC, known global fossil fuel reserves amount to around 4,000 gigatonnes of carbon dioxide ($GtCO_2$), of which only around 1,000 $GtCO_2$ can be burned if there is to be more than a 66 percent chance of keeping warming below the 2ºC target agreed by governments through the UN Framework Convention on Climate Change (UNFCCC).

Figure 1: Fossil fuel reserves



Sources: Fossil Fuel Reserves: IPCC (2011); Carbon budget: IPCC (2013)
Figure adapted from European Climate Foundation
http://www.europeanclimate.org/documents/nocoal2c.pdf

Other analysts suggest that if the world is to avoid exceeding the 2°C target, up to 80 percent of known fossil fuel reserves therefore need to stay in the ground,[11] including at least three-quarters of the world's coal (see Figure 1)**.** Yet research from the Tyndall Centre commissioned by Oxfam shows that, in the absence of an unprecedented change in the global use of fossil fuels, the world is on track for a 4–6ºC temperature rise by the end of the 21st century, which is an even higher temperature rise than the worst-case scenario outlined by the IPCC.[12]

If the world is to avoid exceeding dangerous global warming of 2°C, up to 80 percent of known fossil fuel reserves need to stay in the ground.

This is because current emissions are tracking at or slightly above the IPCC worst-case scenario. Indeed some studies point to emissions exceeding those projected in the IPCC worst-case scenarios by 2–4 times by 2100.[13] Without a comprehensive international framework to limit emissions to 2°C – let alone the 1.5ºC demanded by more than 100 countries at the UNFCCC – economic growth will likely continue to be based on fossil fuels in both rich and poor countries, and incentives for increasingly energy-intensive extraction will only increase. Current trends already indicate that exceeding the IPCC worst-case scenario is a distinct possibility: including the dash for 'unconventional' fossil fuel sources; the

continued high demand for fossil fuels including highly carbon-intensive coal; and sustained high energy prices which make such fossil fuel recovery economically viable.

Box 1: Tyndall Centre research – a scenario of up to six degrees is a distinct possibility

The Tyndall Centre suggests that many of the conditions that would push emissions beyond the IPCC's worst-case scenario are transpiring:

1. Sufficient affordable fossil fuels

Multiple studies suggest that there are sufficient fossil fuel resources to exceed the emission pathway in the upper end of the IPCC scenario, with coal the most carbon-intensive and in many cases most easily recoverable. Yet the recent boom in unconventional oil and gas (tar sands and fracking) has further increased confidence in the possibility of resources being converted to reserves, and consistently high energy prices would justify the increasingly complicated and expensive technologies needed to recover them.

2. Increasing demand

There is a strong likelihood of global economic growth resulting in increased demand for fossil fuels, especially if China's rapid growth is mirrored across other developing nations and there is no concerted action to penalize carbon-intensive sectors/products and incentivize more efficient and cleaner alternatives.

3. Persistently weak controls

The international community has thus far failed to even curtail the increase in the rate of emissions growth and no country has so far successfully reduced the carbon intensity of consumption.

Source: K. Anderson and D. Calverley (2014). *Avoiding dangerous climate change: choosing the science of the possible over the politics of the impossible.* A report commissioned by Oxfam and undertaken by Tyndall Centre researchers.

Impact on food and hunger

Under the IPCC's worst scenario of emissions growth – a scenario the Tyndall Centre suggests we are currently at risk of exceeding – global temperature increases would be likely to exceed 2ºC by 2046;[14] within the lifetimes of most people reading this report. Importantly, average temperature rises are not even across the globe, with surface temperature increases significantly higher in Africa than some other regions.[15] A temperature rise of 2ºC would have widespread human impacts and pose serious challenges for development, including people's ability to grow and access food. These 'hunger costs' of fossil fuels are set to be among the most savage impacts of climate change for millions of people globally.

Under the IPCC's worst scenario of emissions growth – a scenario the Tyndall Centre suggests we are currently at risk of exceeding – global temperature increases would be likely to exceed 2ºC by 2046.

Up to 400 million people across some of the world's poorest countries may face severe reductions in both water and food supplies by 2060 under a high-emissions scenario.[16] There could be 25 million more malnourished children under the age of five in 2050, compared with a world without climate change – that is the equivalent of all of the under-fives in the USA and Canada combined.[17]

Up to 400 million people in the world's poorest countries may face severe reductions in both water and food supplies by 2060 under a high-emissions scenario

Studies have shown that the impacts of emission trajectories even at lower levels than the IPCC worst-case scenario could have a significant impact on growing season temperatures, and that farming communities in the majority of African countries will be dealing with temperatures beyond their experience to date for more than half their crop area by 2050.[18] The IPCC has suggested that, even with adaptation measures, we could see decreases in agricultural yield of up to 2 percent per decade for the rest of the century, with the risk of even more severe impacts increasing after 2050.[19]

By 2050 there could be 25 million more malnourished children under the age of five, compared with a world without climate change. That is the equivalent of all of the under-fives in the USA and Canada combined.

Studies addressing the range of possible experiences under the IPCC worst-case scenario predict mean yield reductions in maize and beans of 24 percent and 71 percent respectively in sub-Saharan Africa by the end of the century. Scientists have warned that such substantial climatic changes could overwhelm hundreds of millions of small-scale farmers, many of whom are already very highly vulnerable.[20] In addition, 90 percent of people globally engaged in fishing are employed in small-scale fisheries, many in poorer countries where this valuable protein source contributes substantially to food security. With a temperature increase of 2ºC, by 2055 there may be a drop of 40–60 percent in yields for fisheries in tropical latitudes. Furthermore, coral reefs provide food and other resources to approximately 500 million people, and the IPCC finds that ocean acidification will have a negative impact on coral reefs under all emissions scenarios, reducing the availability of fish.[21]

Local temperature rises above 1ºC could lead to decreases in agricultural yield of up to 2 percent per decade for the rest of the century, according to the IPCC.

Crucially, these decreases will take place within a context of persisting hunger, a significantly rising global population, and changing global diets – which together are expected to lead to a rise in demand for food by 14 percent per decade.[22] These changes will hit poorer communities harder, because many of the regions most vulnerable to climate change are among the poorest. Exacerbating this, poor communities' ability to withstand shocks and 'bounce back' is reduced by non-climatic factors, such as poverty, lack of social safety nets and poor housing. Importantly, food price rises caused by climate shocks will also hit poorer countries and communities harder, as they spend a much higher proportion of their income on food; for example citizens in Cameroon spend over 40 percent of their income on food, while US citizens spend under 10 percent.[23] Oxfam research has documented how poorer families respond to food price rises – eating too little and substituting cheaper foods, therefore often missing vital nutrients.[24]

By 2055, with a temperature increase of 2ºC, there could be a drop of 40–60 percent in yields for fisheries in tropical latitudes.

Economic impact and business risk

The economic impacts of climate change – and the associated risks to business – are also likely to be wide-reaching. A recent analysis of the economic impacts of climate change in the US has found that, if carbon emissions continue on the current path, by 2050 between $66bn and $106bn of existing US coastal property will likely be below sea level nationwide, increasing to $238–507bn by 2100. This means that some homes with 30 year mortgages in Virginia, North Carolina, New Jersey, Alabama, Florida and Louisiana could be under water before the mortgage is paid off. The report also predicts that, as extreme heat spreads across the middle of the US by the end of the century, some states in the southeast, the lower Great Plains, and the Midwest risk up to a 50–70 percent loss in average annual crop yields (corn, soy, cotton, and wheat).[25]

If carbon emissions continue on their current path, between $66bn and $106bn of existing US coastal property will likely be below sea level nationwide by 2050, increasing to $238–507bn by 2100.

Findings are similarly devastating for other regions – on current trends economic impacts in the Pacific region would amount to 12.7 percent of annual GDP by the end of the century, whereas adaptation costs in a scenario in which greenhouse gas (GHG) concentrations are stabilized below 450ppm would amount to only 0.54 percent of GDP.[26] In Africa economic costs would rise to over 10 percent of regional GDP by the end of the century under business-as-usual emission scenarios.[27]

On current trends, economic impacts in the Pacific region would amount to 12.7 percent of annual GDP by the end of the century.

These kinds of findings have huge implications for business. For example, large food and beverage companies will struggle to adapt to a rapidly changing climate, and are already experiencing negative impacts. In March 2014, General Mills CEO Ken Powell said that in the previous fiscal quarter, extreme weather had dampened sales and cost his company the equivalent of 3–4 percent of annual production, '*which hasn't happened in a long time to us, think decades*'.[28] Unilever has said that it loses €300m ($415m) each year due to extreme weather events such as flooding and extreme cold.[29]

In Africa, economic costs would rise to over 10 percent of regional GDP by the end of the century under business-as-usual emission scenarios.

The potential scale of climate change impacts could negatively affect access to insurance by individuals and industry. Insurance firm Lloyd's of London has warned that the cost of natural catastrophes has grown by $870bn in real terms since 1980.[30] AIG, one of the world's largest insurance companies, has suggested that a failure to mitigate climate change will undermine the ability of large numbers of consumers and businesses to secure private insurance, particularly in high-risk geographic areas.[31]

In March 2014, General Mills CEO Ken Powell said that in the previous fiscal quarter, extreme weather had dampened sales and cost his company the equivalent of 3–4 percent of annual production, 'which hasn't happened in a long time to us, think decades'.

Under these circumstances, governments are likely to become insurers of last resort, necessarily providing support for those unable to secure private insurance, and paying for losses incurred from extreme weather events that exceed the willingness or capacity of the insurance industry to pay. This scenario has already begun to manifest in areas such as South Florida. US government exposure to losses in hurricane-exposed states rose to a record $885bn in 2011. Similarly, most crops in the USA are insured against extreme weather events, with the federal government heavily subsidizing premiums and claims, leading to additional burdens on taxpayers.[32]

As a result, Standard & Poor's, one of the two big global credit rating agencies, has observed that climate change is likely to have a significant impact on countries' credit-worthiness. As lower income countries are typically more vulnerable to climate change, this stands to exacerbate inequality further, as poorer countries find it harder – and more expensive – to access credit.[33]

Health impacts

Even if fossil fuels had no role in driving climate change, the immediate impacts of burning fossil fuels on public health alone should provide strong incentives to embrace alternatives.

The World Health Organization (WHO) has estimated that outdoor air pollution in both cities and rural areas caused 3.7 million premature deaths in 2012. Around 88 percent of those deaths were in low- and middle-income countries. Emissions from coal power plants and from fuel-based transport constitute significant sources of this air pollution.[34]

A 2013 study by the Heath and Environment Alliance (HEAL) estimated that emissions from coal power stations in Europe cause more than 18,000 premature deaths and lead to four million lost working days each year.[35] The health cost was calculated at €43bn per year.[36] Another study put total estimated deaths at 22,000 in 2010,[37] with a total loss of 240,000 life years due to premature deaths.[38] A 2012 World Bank report has stated that the air pollution in Kosovo – major sources of which are coal and lignite burning – results every year in 835 early deaths, 310 new cases of chronic bronchitis, 22,900 new cases of respiratory diseases among children and 11,600 emergency hospital visits.

Emissions from coal power stations in Europe cause more than 18,000 premature deaths and lead to four million lost working days each year according to 2013 estimates from the Heath and Environment Alliance. The health cost was calculated at €43bn per year.

Findings are similarly staggering in China, where studies estimate that in 2011 coal power plants could have contributed to an estimated quarter-of-a-million premature deaths.[39] Analysis focusing on India found that, in 2011–12, coal plants contributed to 85–115,000 deaths, and the costs of related health impacts amounted to $3.3–4.6bn.[40] Most recently, the New Climate Economy Report suggested that health costs of air pollution in the 15 largest CO_2 emitting countries averaged over 4 percent of GDP.[41]

Loss of land and livelihoods

Furthermore, fossil fuel extraction frequently leads to widespread community displacement and negatively affects people's ability to grow and access food due to the loss of agricultural land.

Analysis focusing on India found that in 2011–12, coal plants contributed to 85–115,000 deaths and the costs of related health impacts amounted to $3.3–4.6bn.

In Bangladesh. UN experts and civil society organizations have warned that the Phulbari coal mine could immediately displace up to 130,000 people, with up to 220,000 potentially affected by the negative impacts on irrigation channels and wells.[42] The project would destroy around 12,000 hectares of productive agricultural land which provides rice and wheat for the rest of the country, and it could destroy waterways supporting 1,000 fisheries and nearly 50,000 fruit trees.[43]

In Mozambique, thousands of local people have experienced sustained disruption in accessing food, water and work as a result of the coal mining company operations of Rio Tinto and Vale.[44] And in Kosovo the planned expansion of a lignite coal-based power plant will forcefully displace more than 7,000 people living on 26 agricultural settlements spread over 16 km^2, leading to increased food insecurity and the loss of common land and resources.[45] The Cerrejon open-pit coal mine in Colombia is the largest of its kind in Latin America and the ninth largest producer of thermal coal globally, exporting heavily to the US and Europe. It extends over 69,000 hectares on land of the indigenous Wayuu and Afro-Colombian communities,[46] many of whom have been forced to relocate from their ancestral lands and whose food security has been compromised as a result.[47,48]

Box 2: South Africa: Witbank

The impact of a century's worth of large-scale coal mining and burning in the Mpumalanga Highveld Region (Witbank) has devastated local air, water and soil quality. Coal has detrimentally affected the respiratory health of the population.

Thabang Makua calls Witbank, his home town, 'Hell'. Thabang complains that while the area is known to be an air-pollution high priority, new coal mining and coal-fired power station applications are still being accepted by the government. These new plants will burn poor quality coal, as high-quality supplies have been depleted.

Similarly, local resident Tshepo Vilane explains how the community of Witbank is grossly affected by respiratory disease such as asthma, tuberculosis and cancer. Witbank residents are afraid to take a stand and risk losing their jobs in the polluting industries and mines.

Thabang also writes of how the government is failing to react to the problem of acid mine drainage, which has destroyed the drinking water supply of his community and which flows freely through the local neighbourhood. Thabang is one of the many individuals across South Africa linking up with environmental justice organizations such as groundWork and Earthlife Africa, to oppose the construction of new coal-fired power stations and new coal mines.

Source: Earthlife Johannesburg, 'Toxic air leads local activists to resist coal in South Africa'

2 GLOBAL CLIMATE REGIME: RHETORIC VS ACTION

At the Copenhagen Climate Summit in 2009, all countries committed to limit global temperature rise to 2ºC. To this end the 'Durban Platform' in 2011 committed all countries to adopt a new agreement in Paris in 2015, with legal force and applicable to all countries for the post-2020 period. Key countries and regional blocs have also made proposals – the EU is discussing a proposal of 40 percent cuts in carbon emissions by 2030, with the potential to rise further in the context of an international agreement.[49] In June 2014 US President Barack Obama unveiled policies to cut 'climate pollution' in the US, which would see carbon emissions in the power sector drop 30 percent on 2005 levels by 2030.[50] There have also recently been discussions in China on an 'absolute carbon cap' after 2016.[51]

These commitments and proposals all demonstrate that the international community is beginning to wake up to the reality of climate change and adopt the necessary rhetoric. Yet carbon emission reduction offers on the table so far are not significant enough to advance the necessary transition, and thereby shift private and public finance accordingly. The 2010 'Cancun Pledges' are the most recent global commitments, and the IPCC has confirmed that the carbon emission reduction targets within these pledges are not consistent with emission trajectories that would keep global warming below 2ºC.[52, 53]

Some climate experts – including eminent climate scientist Kevin Anderson – suggest that to have a likely chance of reducing global warming to 2ºC while taking equity into account requires rich industrialized countries (i.e. Annex 1) to embark on carbon emission reductions of at least 10 percent per annum – starting immediately. This rate of emission reduction would require a target in excess of an 80 percent carbon emission reduction by 2030 – in effect, a phase-out of fossil fuel emissions by that point.[54]

Some scientists suggest that limiting global warming to 2ºC while taking equity into account requires rich industrialized countries to embark on carbon emission reductions of at least 10 percent per annum – starting immediately.

Despite this, a number of countries which must move first and fastest are instead guilty of reneging on existing commitments or promoting energy policies which increase emissions. In 2011 Canada officially withdrew from the Kyoto Protocol – its emissions having risen by around one-third since 1990. Canada has since been aggressively pursuing tar sands extraction – one of the most carbon-intensive fossil fuels[55] – increasing production from 700,000 barrels a day in 2000, to more than 1.7 million barrels a day in 2013.[56] Australia has also moved backwards, through repealing the national carbon tax[57] which was designed to incentivize emission reductions in a country with among the world's highest per capita carbon emissions.[58]

Canada officially withdrew from the Kyoto Protocol in 2011 – its emissions having risen by around one-third since 1990.

Ambition by rich developed nations is crucial, not just because they account for a significant portion of historic global emissions and have a greater capacity to act. It is imperative due to the signal it sends to the rest of the world that a low-carbon future is a political priority – leveraging ambition from others and especially from higher-emitting and rapidly growing developing countries whose emissions are increasing. Carbon emission projections from the EIA suggest that on current trends, non-OECD countries will account for 94 percent of the total global increase in carbon emissions from 2010 to 2040, with 49 percent of that increase coming from China.[59]

While per capita emissions from consumption in these countries remain far below their OECD equivalents, it is clear that to keep warming below 2ºC, relatively richer and higher-emitting developing nations will need to play their role in reducing business-as-usual emissions in the future. While adhering to the principle of equity naturally means that poorer developing countries especially will move more slowly while prioritizing immediate social and economic needs, Anderson's analysis suggests that even if rich nations' emissions were to peak today, developing countries' collective emissions would need to peak as early as 2025, and fossil fuel emissions phased out globally by 2050, with the more responsible and capable countries moving faster than others.[60]

On current trends, non-OECD countries could account for 94 percent of the total global increase in carbon emissions from 2010 to 2040, with 49 percent of that increase coming from China.

3 FILTHY FINANCE AND POLLUTER POWER

Despite global rhetoric on climate change, the failure to properly regulate carbon emissions through ambitious climate and financial policy means that money continues to flow into the fossil fuel industry from both private investors and the public purse. The scale of the sums involved means that the fossil fuel industry has a lot to lose from any regulatory framework that would fundamentally shift the status quo – so it spends millions of dollars trying to block action.

FILTHY FINANCE

In 2012, the Carbon Tracker Initiative released an influential report mapping the carbon reserves held by companies listed on the world's major stock exchanges.[61] The report discovered that only one-fifth of carbon reserves currently held by companies listed on stock exchanges can ever be burned if the world is to keep global warming below 2ºC.

Only one-fifth of carbon reserves currently held by companies listed on stock exchanges can ever be burned if the world is to keep global warming below 2ºC.

The quantity of money invested in fossil fuels is significant. As of 31 December 2013, shares in the 10 largest fossil fuel companies (by market capitalization) were worth a total of $1.8 trillion (see Table 1), and shares in the largest 50 fossil fuel companies were worth a total of $3.78 trillion.[62]

Taking a snapshot of the shareholders in May 2014, as well as tracking bank loans and bond underwriting deals since the start of 2013, reveals the scale of recent financial flows: HSBC, JP Morgan and Deutsche Bank alone have financial interests in Shell to the tune of almost $6.4bn, while Morgan Stanley, BNP Paribas and HSBC have financial interests in BP to the tune of over $3.6bn.[63] Large institutional investors BlackRock and Legal & General together have among the largest stake in Shell and BP – together owning nearly $39bn in shares across both companies.[64] In short, financial investors have large amounts of money tied up in the assumption that the world’s heavy reliance on fossil fuels is here to stay.

Table 1: Fossil fuel giants: value of shares as of 31 December 2013

Company (nationality)	Value of shares
ExxonMobil (US)	$442.1bn
Chevron (US)	$240.2bn
Royal Dutch Shell (UK and Netherlands)	$233.8bn
PetroChina (China)	$229.4bn
BP (UK)	$150.7bn
TOTAL (France)	$145.9bn
Schlumberger (US)	$118.7bn
Gazprom (Russia)	$99.2bn
Petrobras (Brazil)	$91.0bn
Sinopec (China)	$88.2bn
Total	**$1.8 trillion**

Source: http://cdn.ihs.com/www/energy50/IHS-Energy-50-Final-2014.pdf

Climate risk and carbon bubbles

The Carbon Tracker Initiative's estimates of reserves and associated global warming make it clear that financial actors – including asset managers and thereby ordinary people with savings – are currently funding runaway climate change. Besides ethical concerns, the economic and business risks of climate change referenced in this paper – such as climate-induced losses in the food and beverage industries – should present significant concern to investors. Furthermore, governments will increasingly be responsible for picking up the bill for climate change, which in turn affects sovereign credit-worthiness. As investors buy enormous quantities of debt issued by governments all over the world, they should have a financial interest in their economic health.

These climate risks may be compounded by how governments begin to react as climate impacts become apparent, through introducing regulations to limit carbon emissions. While such regulations are currently not being introduced fast enough, it is likely that governments will begin to act more decisively once climate impacts become more severe. If this happens, many of the carbon reserves currently held by listed companies – in which many investors hold a stake – may no longer be able to be burned and could thus become worthless 'stranded assets'. Similarly, the vast amounts of capital invested over the years in long-term projects, such as finding and developing carbon reserves, may then be viewed as 'wasted capital' that could have been invested elsewhere – for example in sustainable, renewable alternatives. At the current rate of capital expenditure, the next decade will see over $6 trillion allocated to such long-term carbon projects.[65]

A crucial observation is that investors will be losers either way: if climate regulation is *not sufficient*, they will lose out due to the impact of runaway climate change on other investments. If it *is introduced* – albeit potentially too late to keep warming below 2ºC, but in a last ditch attempt to deal with the climate problem – then they risk owning heaps of worthless assets, having wasted valuable capital that could have been invested more fruitfully elsewhere. The IEA has estimated that a global energy policy scenario that limits carbon emissions to 450ppm could potentially strand $300bn of fossil fuel assets.[66] This situation has also been referred to as a dangerous 'carbon bubble' that will inevitably burst.

A global energy policy scenario that limits carbon emissions to 450ppm could potentially strand $300bn of fossil fuel assets, according to IEA estimates.

Some investors are beginning to question the long-term economic viability of heavily investing in fossil fuel exploration and development. In 2013, for example, the 100 institutional investors in the Investor Network on Climate Risk, which collectively holds assets worth $11 trillion, came together to ask 34 companies in the oil, gas, mining and utilities sectors to review their assets at risk in light of the potential impact of climate change regulation.[67]

Some asset managers are also withdrawing from fossil fuels. In 2013 Norwegian pension fund, Storebrand, decided to divest from 19 fossil fuel companies on the basis that they will be '*worthless financially*' in the future.[68] Swedish pension fund, AP4, decided to reduce investments in carbon-intensive companies, clearly stating that '*this sustainable approach isn't about charity, but about enhancing returns*'.[69] Meanwhile, the Dutch ASN Bank has formally set itself a goal of achieving net carbon neutrality in all its investments by 2030.[70] To mark the UN Climate Leaders' Summit in September 2014 there were also a number of announcements from investors to divest from fossil fuels[71] – including a commitment from the Rockefeller Brothers Fund – and the launch of a joint initiative by UNEP and a number of large institutional investors to decarbonize $100bn in investments by 2015.[72]

However, aside from these 'pioneers', too many financial actors have not voiced any significant concerns about capital being invested in this way. In 2012 alone, fossil fuel companies spent $674bn on fossil fuel exploration and development projects[73] on the assumption that they will generate a stable income stream in the future. This is largely because capital markets have a chronic problem with short-termism. If an investor is only planning to hold an asset for a year, a month, a day, or sometimes even just a fraction of a second, then they have no incentive to take into account risks, such as those posed by climate change – or climate regulation – that are likely only to be fully felt years or decades from now. By contrast, the fossil fuel industry is highly profitable *now* and – with incentives in the industry as they currently stand – making good returns in the short term is the primary motivation.

In 2012, fossil fuel companies spent $674bn on fossil fuel exploration and development projects on the assumption that they will generate a stable income stream in the future.

The extent to which the financial sector can take action is also limited by the considerable size and importance of the fossil fuel industry across the world. This also means that so-called 'passive investors' can barely avoid fossil fuels in their portfolio. Rather than carefully selecting stocks, passive investment involves buying the major components of a stock, bond or commodities index, such as the FTSE100. Energy and utilities companies are the largest sector in the FTSE100, comprising 22 percent of the

index,[74] and are the third-largest sector in both the US S&P 500 and the S&P's Global 100.[75] So, by default, a large chunk of the money passively invested in stock market indices is invested in fossil fuel companies. This is why BlackRock is so heavily invested in Shell – the former is the largest provider of passive investment funds globally. This also means that individuals' pensions are also flowing into fossil fuels – for example some 56 percent of UK pension assets are invested in passive strategies.[76]

In April 2014 a series of fossil-free indices was co-launched by FTSE and BlackRock – which in theory will help passive investors to avoid high-carbon assets – though there is still a long way to go before the estimated 11 percent ($7.3 trillion) of global assets currently invested in passive strategies are effectively decarbonized.

Financial regulation

The volume of investment in fossil fuels is not only due to investor short-sightedness and the 'routines' of the financial sector. It is also influenced by the financial 'rules of the game'. Currently governments and regulators around the world are reneging on their duty to promote long-term financial stability and introduce policies and incentives that would drive capital towards social, economic and environmental 'goods' rather than 'bads'.

On a global level, the Basel Committee on Banking Supervision (BCBS), which is comprised of members from central banks and financial regulators from 27 countries, is in charge of setting the so-called Basel Accords: rules specifying how much capital banks must hold aside in case of things going wrong. The amount of capital required varies according to the riskiness of the assets held by a bank. This helps to discourage big risk taking, as very risky assets become much more expensive to hold than less risky ones. Despite a revision of the rules in recent years in light of the global financial crisis, the BCBS did not consider assessing the climate risk inherent in carbon intensive assets. This is despite the fact that it has a mandate to ensure banking stability, which could be threatened by both climate change and climate regulation.

Rules governing listing requirements on stock exchanges often also fail to take into account climate risks to the extent needed. For example, while the UK government has ambitious climate commitments, the London Stock Exchange alone has listed fossil fuel reserves that, if burned, would mean that the UK would exceed its carbon budget (for now until 2050) ten times over. Yet 'assessment of climate risk' and 'disclosure of carbon reserves' do not feature among listing requirements. As such, many stock exchanges are profiting from the fees charged for listing assets that are fuelling climate change.

There is also confusion in some jurisdictions surrounding so-called 'fiduciary duty', i.e. the legal obligations companies are under when acting in the financial interests of others. This has led many investors to reject seemingly 'social and environmental' considerations when making investment decisions. However, a recent consultation by the UK Law Commission concluded that trustees could take into account ethical,

environmental or social governance issues if they are 'financially material'.[77] Taking into account the fact that both climate change and increasing climate regulation pose financially material risks to investments, it seems that there is more scope for broader climate risks to be factored into investment decisions.

Public financing

Governments are failing in their responsibility to regulate to steer investment away from risky fossil fuels and avoid a carbon bubble destabilizing the financial market. But worse – they are also actively incentivizing the wrong kind of investment through a range of subsidies, tax breaks and incentives that support the industry.

The IEA estimated that, in 2012, fossil fuels globally enjoyed more than five times the subsidies than the renewable energy sector.[78] The IMF has estimated that, in 2011, pre-tax subsidies for petroleum products, electricity, natural gas and coal reached $480bn. Factoring in the failure to tax the 'negative externalities' of fossil fuels – including social, health, environmental and climate impacts – and reduced rates of VAT, the total figure rose to a staggering $1.9 trillion.[79] Fossil fuel subsidies can be for both producers and consumers and are highest per capita in countries which have the greatest historic responsibility to tackle climate change, and the greatest financial capacity to transform their economies – including the USA, Russia, Canada and Australia. While consumption subsidies can be an important buffer for poorer communities against rising energy costs, production subsidies go directly to the fossil fuel and energy industry and help to 'de-risk' fossil fuel investment. They come in a variety of forms, from direct loans and grants to financial guarantees, spending on supportive infrastructure, as well as generous tax breaks.

In 2012, fossil fuels enjoyed more than five times the subsidies globally than the renewable energy sector.

Table 2: Post-tax fossil fuel subsidies in a sample of the world's largest economies

Country	Most recent (2011) estimate of total fossil fuel subsidies	Equivalent subsidy per person	Subsidy as % of GDP
US	$517bn	$1,660	3%
Australia	$25bn	$1,111	2%
Russia	$119bn	$836	6%
Canada	$26bn	$769	2%
Japan	$46bn	$360	1%
Germany	$22bn	$266	1%
China	$280bn	$208	4%
UK	$11bn	$176	0%
France	$5bn	$72	0%
India	$84bn	$69	4%

Source: World Bank data and http://www.imf.org/external/np/pp/eng/2013/012813.pdf

A recent report by Oil Change International shows how in 2013 the federal and state governments in the US handed out $21.6bn in subsidies for oil, gas and coal exploration.[80] This included $117m spent on waterway and harbour transport for coal,[81] the leasing of federal land in certain regions to coal companies at below market rates,[82] and loan guarantees for domestic coal projects.[83] In Poland, coal power generators receive generous amounts of EU Emission Trading System allowances for free.[84]

Federal and state governments in the US handed out $21.6bn in subsidies for oil, gas and coal exploration in 2013.

Tax breaks for the fossil fuel industry are widespread. The UK government awarded tax breaks to new oil and gas fields between 2012 and 2013 worth a total of £1.952bn over five years.[85] These tax breaks coincided with record levels of investment in the development of new North Sea fields, with a spokesperson for the industry claiming that the incentives had 'commercialised what would have been uncommercial projects'.[86] In the last budget, Chancellor George Osborne promised that the government would review the whole oil and gas tax regime to 'make sure it is fit for the purpose of extracting every drop of oil we can'.[87] The UK is designing similar tax incentives to kick-start investment into the nascent shale gas industry – the favourable tax regime will be more generous than those in the US and the rest of Europe.[88] In Canada, to help stimulate investment into tar sands, the government foregoes about $0.3bn a year in tax revenues by allowing tar sands producers to quickly write off the cost of their investment for income tax purposes.[89]

Governments also use public funds to de-risk investment in other ways. For example, Export Credit Agencies in rich countries give financial guarantees to domestic companies to shield them from the risks involved in investing or exporting abroad. Between 2007 and 2013, national export credit agencies from OECD countries provided at least $32bn for coal projects abroad – over 60 percent of total public support for coal over this period. Japan and Korea gave the most export credits for coal plants, with Germany and France the leading European providers.[90] The US Export-Import Bank provided $22.2bn worth of loans and loan guarantees to overseas fossil fuels projects between 2009 and 2013.[91]

National export credit agencies from OECD countries provided at least $32bn for coal projects abroad between 2007 and 2013.

While production subsidies that directly support the fossil fuel industry are particularly problematic due to the knock-on effect this also has on private investment, consumer subsidies can also be a blunt and unsustainable tool for reducing energy bills. The European Commission estimates that the price of Europe's oil and gas will only increase in coming decades – as bills go up, the pressure to maintain or increase consumer subsidies will only intensify, thereby potentially wasting valuable public funds that could instead be invested in efficiency measures and reducing fossil fuel dependence.[92] Improving energy efficiency by 40 percent by 2030 would save households and industry over €239bn annually on energy bills – amounting to €300 per household by 2030.[93]

Fossil fuel subsidies are particularly problematic in developed countries, which shoulder the greatest responsibility to advance a low-carbon future. But they also have questionable benefits in developing countries, where there can be significant benefit leakage to higher income groups, with some studies suggesting that the top income quintile captures six times more in subsidies than the bottom.[94] An IMF paper found that, in low- and middle-income countries, 61, 54 and 42 percent of gasoline, liquefied petroleum gas and diesel subsidies, respectively, went to the top quintile income group, with only 3, 4 and 7 percent respectively going to the bottom quintile.[95] Only kerosene subsidies did not disproportionately benefit richer quintiles. While large numbers of poor people do benefit from fuel subsidies through lower transport costs and food costs in particular, there are often better ways to use scarce public money to benefit the poorest. Too often fossil fuel subsidies far exceed subsidies in other sectors that have much stronger pro-poor benefits – in Egypt, Indonesia, Pakistan and Venezuela, the fossil fuel industry already enjoys twice as much support as public health systems.[96]

In low- and middle-income countries, 61, 54 and 42 percent of gasoline, liquefied petroleum gas and diesel subsidies respectively went to the top quintile income group – with only 3, 4 and 7 percent respectively going to the bottom quintile.

Despite the importance of fossil fuel subsidy reform and shifting public finance to clean energy, and despite some positive trends, international financial institutions (IFIs) are still investing heavily in supporting fossil fuels in developing countries. The World Bank Group provided an estimated $3bn of funding for fossil fuels in 2012.[97] Though its lending to clean energy has increased between 2008 and 2013 – while lending to fossil fuels has proportionately decreased – the World Bank Group still consistently lends more to the fossil fuels sector than to clean energy projects. In 2013, 42 percent of the IFC's funding went to fossil fuel projects compared with 29 percent for clean energy;[98] and 49 percent of IBRD's funding went to fossil fuel projects compared with 33 percent for clean energy. As a global standard setter for development finance, particularly through its own findings on the overall development benefits of financing low-carbon energy,[99] the World Bank Group has the responsibility to ensure that these numbers change.

The World Bank Group provided an estimated $3bn of funding for fossil fuels in 2012.

Table 3: Proportion of World Bank Group energy lending going to clean energy and fossil fuel projects

	Lending to clean energy projects	Lending to fossil fuel projects	Other (including large hydropower and transmission and distribution)
2008	11%	46%	43%
2009	16%	45%	39%
2010	20%	59%	21%
2011	19%	23%	58%
2012	30%	39%	31%
2013	24%	39%	37%

Source: http://priceofoil.org/content/uploads/2013/10/OCI-World-Bank-Energy-Lending-Oct-2013-Final.pdf

In certain circumstances – in the poorest countries where there are limited alternatives – public finance for fossil fuel development will be important for immediate social and economic needs. Overall, however, tackling both production and consumption subsidies for fossil fuels is crucial, as the opportunity costs are high. In rich and high-emitting countries, reforming subsidies is especially important in efforts to kick-start a transition, because government intervention in markets often acts as a signifier to the private sector as to the direction of future policy. Investors are less likely divest from fossil fuels and invest in renewables while governments consistently show greater support for the former than the latter.

Box 3: Pro-poor fossil fuel subsidy reform

Fossil fuel subsidy reform in poorer countries must be embarked upon carefully, as the poorest people who benefit from subsidies are likely to lack other important social safety nets, and so the removal of already limited benefits can lead to further hardship and social unrest. In many countries the public are often understandably sceptical that – once removed – fuel subsidies will be necessarily be replaced by other policies that will benefit them, and their rapid removal can lead to significant increases in poverty. Poor management of fossil fuel subsidy reform has led to protests and riots in Bolivia (2010), Nigeria (2012), Cameroon (2008), Venezuela (1989) and Yemen (2005).[100]

In Bolivia, the overnight removal of $150m of annual subsidies in 2010 resulted in an instant price increase of over 80 percent, resulting in strikes and demonstrations.[101] As a result of the public outcry, the subsidies were reinstated. In Nigeria, the abrupt and poorly communicated end to subsidies in 2012 led to the doubling of gas prices; protests and riots erupted. In both cases the government was forced to reinstitute the subsidy.

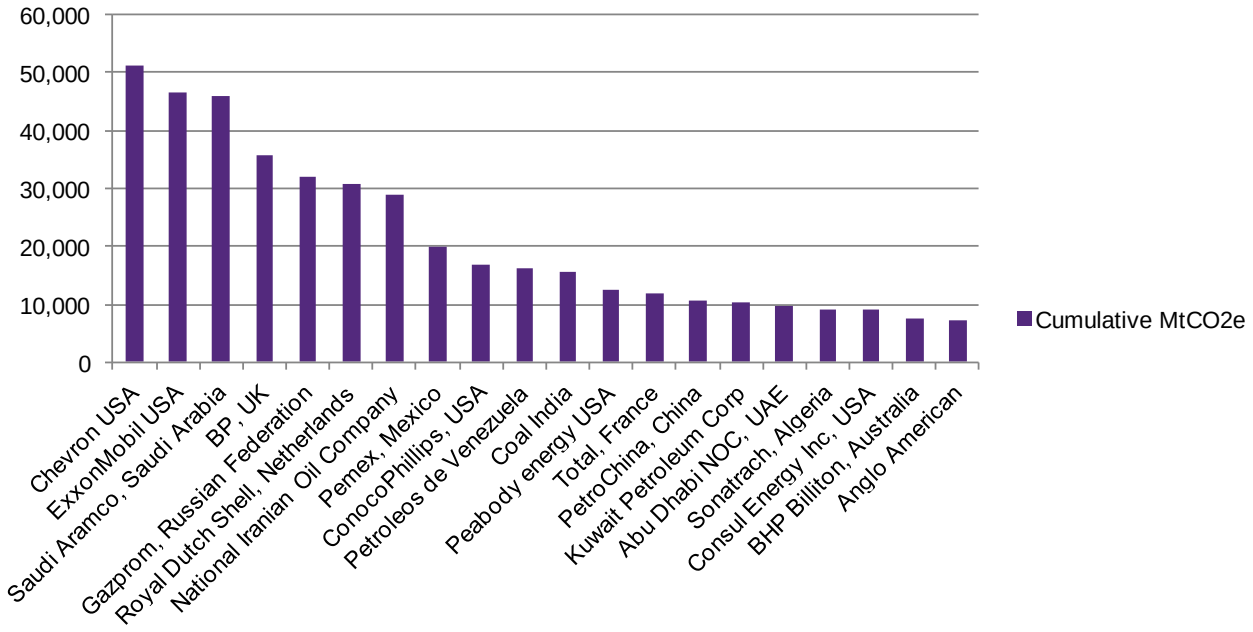
By contrast, Iran's 'targeted subsidies reform', which was initiated in 2010, was more successful. The government slashed its massive $50–60bn of indirect subsidies and, in parallel, compensated households facing rising costs to the tune of $30bn. Enterprises were also provided with $10–15bn of investment in energy efficiency measures.[102]

POLLUTER POWER: VESTED INTERESTS

The vast sums of finance flowing into the fossil fuel industry from both private and public coffers – despite the considerable financial risks and the significant opportunity costs of public money being used in this way – are in turn determined by the widespread influence that fossil fuel industry has on the decision making process, in a concerted effort to defend its bottom line.

It is unsurprising that such interests are keen to protect the status quo, as they know that climate regulation would hit them hardest. In April 2014, the Carbon Accountability Institute published an ambitious study illustrating how 90 corporate entities or 'Carbon Majors' are responsible for two-thirds of the greenhouse gases emitted since the beginning of the industrial era (see Figure 2).[103]

Figure 2: Cumulative emissions of top 20 investor and state-owned entities



Source: R. Heede (2014) 'Carbon Majors: Accounting for carbon and methane emissions 1854-2010, Methods & Results Report', Climate Mitigation Services, http://carbonmajors.org/wp/wp-content/uploads/2014/04/MRR-9.1-Apr14R.pdf

In 2013 the combined profit of the top five publicly traded oil companies (Exxon, BP, Shell, Chevron and ConocoPhillips) was $93bn.[104] The salaries of the CEOs of the five largest oil companies came to $95.8m in 2012. They have a lot to lose – and therefore significant motivation and enough financial clout to pay for expensive PR campaigns and lobbying services in an effort to undermine climate legislation which threatens their business.

In 2013, the combined profit of the top five publicly traded oil companies (Exxon, BP, Shell, Chevron and ConocoPhillips) was $93bn. The salaries of the CEOs of the five largest oil companies alone came to $95.8m in 2012.

Early in 2014, one of the top 20 companies in this ranking – Peabody Energy – teamed up with the world's largest PR firm, Burson-Marsteller, to launch a campaign extolling the virtues of coal in alleviating global energy poverty.[105] Yet not only are the poverty reduction benefits of coal contested, but the campaign came in response to government proposals to curtail emissions from coal power plants *within the US*, which play no role in delivering global energy access for the poor and on the contrary, drive climate change which threatens poor people's livelihoods globally. Peabody's implication that regulation to reduce its emissions in the US amounts to an assault on efforts to reduce global energy poverty represents a determined effort at 'poverty washing', to distract the public from its true motivations.

Peabody is not alone in spending money in this way. The combined spend of the fossil fuel industry on lobbying in the US and the EU amounts to $213m per year – well in excess of half a million dollars every day and totalling $4m a week. At the EU level, this industry and its respective trade associations spend at least €44m every year on lobbying activities – around €120,000 per day.[106] In the US in 2013, the oil, gas and coal industries spent almost $157m on lobbying[107] – over $430,000 per day, or $24,000 per hour.[108] By comparison, the entire alternative energy sector in the US spent the same amount on lobbying in one year as just the top two spending oil giants.[109]

The combined spend of the fossil fuel industry on lobbying in the US and the EU amounts to $213m per year – well in excess of half a million dollars every day and totalling $4m a week.

These figures are sobering when contrasted with the financial capacity of those who stand to lose the most from the continued burning of fossil fuels and their contribution to devastating climate change. For example, the estimated costs of funding one negotiator from every developing country to attend one two-week session of the global climate change negotiations[110] is the same amount that the fossil fuel industry across the EU and US spend on lobbying in just two days.[111] And while the industry continues to spend significant amounts of money on efforts to stall the action needed, the Nepalese government still cannot raise the $160m per year needed for crucial adaptation interventions – an amount equivalent to the annual lobbying by US oil, gas and coal interests.[112]

The Nepalese government still cannot raise the $160m per year needed for crucial adaptation interventions – an amount equivalent to the annual lobbying by US oil, gas and coal interests.

The negotiations around the 'EU 2030 package' illustrate the influence of corporate and vested interests in decision making. The Commission's proposals for the 2030 climate and energy package, released in January 2014, recommend a 40 percent emissions reduction target; far short of the minimum 55 percent reductions needed if the EU is to contribute its fair share globally to reducing carbon emissions and keep the global temperature rise below 2ºC. Despite a wide range of experts and civil society organizations pointing to the need for at least 55 percent cuts, the Commission's proposals bear a closer resemblance to the position advocated by BusinessEurope – one of the most powerful business lobbies in the EU – for an overall target of 40 percent.

Sometimes lobbying activities are even given a helping hand by governments. For example, the Canadian government uses its diplomatic arm to further the interests of the tar sands industry. It has set up a 'Pan-European Oil Sands Team' which organizes government lobbying against the implementation of EU regulation aimed at gradually reducing the carbon intensity of transport fuels used within Europe, as part of the effort to hit emissions reductions targets.[113] This legislation seeks to label tar sands-derived fuel as a dirty fuel in accordance with its larger carbon footprint, the effect of which would be to discourage its future import into the EU market.

According to strategy documents obtained under freedom of information laws, the dedicated lobby team is based in Canadian diplomatic missions abroad, and organizes activities such as site visits to Canadian tar sand for European politicians. The team coordinates closely with key private investors like Shell, Statoil and Total. A similar government-sponsored advocacy strategy is in place for the USA, backed by a $90m budget line in 2012. [114]

The UK government has similarly put its influence and resources behind companies invested in the tar sands industry. The UK Trade and Investment office that opened recently in Calgary – the Canadian tar sands 'capital' – is there exclusively to help British companies with an interest in the tar sands business – primarily Shell and BP. The UKTI office is even hosted in the building of a tar sands company, Suncor.[115] In Brussels, the UK government has played a key role in undermining the Fuel Quality Directive, supporting the Canadian government and Shell/BP's position. [116]

Media reports and documents obtained under freedom of information show that the UK government failed to vote in favour of the proposals, instead putting forward alternatives which they admit would cause a delay.[117] Several years after it was supposed to take effect, the legislation continues to be stalled, and it now looks like the safeguards on increasingly polluting fuels may never be applied – meaning there is nothing to stop the fuel being pumped in Europe's petrol stations from getting dirtier rather than cleaner. In June 2014, the first shipment of tar sands arrived on European shores.

These asymmetries of power, money and influence skew climate change policies to disproportionately take account of a small minority of vested interests, rather than reflect the need to protect the developmental prospects of some of the world's poorest countries and most vulnerable people. This partly accounts for why climate regulation consistently falls short of what is needed – those with more money have more power, and therefore more access to decision makers.

4 WHY A LOW-CARBON TRANSITION IS POSSIBLE AND DESIRABLE

The tragedy in the failure to tackle climate change concertedly and shift private and public finance in the right direction lies foremost in the fact that the poorest and most vulnerable will be the first to feel the devastating consequences – not least in their ability to grow and access food and water. However, it is also a tragic failing to embrace one of the greatest opportunities to build and finance a cleaner, fairer global energy system that better serves the needs of people and planet.

The IPCC has recently estimated that it would cost an average of 0.06 percent of global GDP per year to the end of the century to fund a low carbon transition. Recent studies by the World Bank have sought to bust the myth that tackling climate change would stall the global economy. On the contrary, a combination of climate regulations and incentives in the transport and energy efficiency sectors alone could deliver 30 percent of the total emission reductions needed by 2030 to keep below 2ºC warming, as well as resulting in an estimated $1.8–2.6 trillion boost to GDP over the same period.[118]

A combination of climate regulations and incentives in the transport and energy efficiency sectors could deliver 30 percent of the total emission reductions needed by 2030 to keep below 2ºC warming, and result in an estimated $1.8–2.6 trillion boost to GDP.

The IEA has also pointed to the considerable benefits of acting now. In a ground-breaking report in May 2014, it stated that it would cost $44 trillion to secure a clean energy future globally by 2050, which accounts for only a small portion of global GDP, with costs ultimately offset by over $115 trillion in fuel savings.[119] It has also stated that energy efficiency measures can represent approximately 44 percent of global GHG mitigation requirements by 2035, which would provide, on average, a one percent increase in global GDP.[120] Importantly, the IEA has made clear that, for every year of delay, the costs of decarbonization increase due to high carbon 'lock-in'. For every $1 of investment in cleaner technology that is avoided in the power sector before 2020, an additional $4.30 would need to be spent after 2020 to compensate for the increased emissions.[121]

It would cost $44 trillion to secure a clean energy future globally by 2050, which accounts for only a small portion of global GDP.

For every $1 of investment in cleaner technology avoided in the power sector before 2020, an additional $4.30 would need to be spent after 2020 to compensate for the increased emissions.

Low-carbon and renewable energy sources can also enhance energy security by improving indigenous energy supplies, thereby reducing dependence on imported fossil fuels and providing flexibility of energy supply beyond existing and often inadequate grid infrastructures.[122] For example, India faces massive challenges in producing energy to meet what will constitute a doubling in demand over the next decade – both for industrial growth and to meet the needs of the 300 million Indians who currently lack access to energy. While fossil fuels are understandably currently playing a significant role in this energy expansion, the IEA suggests that relying solely on coal and gas for electricity generation will require a massive and costly increase in fossil fuel imports to meet demand in the future.[123]

Reducing total energy demand also contributes to energy security while avoiding carbon emissions and cutting household bills. The EU, for example, imports considerable amounts of fossil fuel energy, covering over 50 percent of its energy supply, with Russia accounting for the largest share of imports.[124] In 2013, the EU spent €400bn on importing fossil fuels,[125] equivalent to €790 per person.[126] For oil and gas imports alone, Russian energy giants received the equivalent of about €250 per EU citizen in 2013.[127] Studies show that improving energy efficiency in the EU by 40 percent by 2030 could save households and industry over €239bn annually on energy bills. Each household would enjoy an average saving of over €300 every year by 2030.[128]

Improving energy efficiency in the EU by 40 percent by 2030 could save households and industry over €239bn annually. Each household would enjoy an average saving of over €300 every year.

Importantly, opportunities also exist in Russia itself for a low-carbon transition. Russia possesses unique geothermal resources for the production of electricity, provision of district heating systems for industrial and agricultural needs, which are located throughout almost the whole of the country. According to a 2010 academic study, more than 45 percent of total energy resources are used for heat supply of cities, settlements and industrial complexes and up to 30 percent of those energy resources could be met using geothermal heat.[129]

Box 4: Improving energy security and creating jobs in Germany

Solar and wind provided around 31 percent of Germany's electricity generation in the first half of 2014, and a new solar record was set in June 2014 as solar generated over half the country's total electricity for part of a day. Based on current trends, by 2020, solar and wind may account for 50 percent of the country's electricity generation.[130]

Wind and solar have driven down electricity costs by 32 percent since 2010.[131] The initial deployment costs have also fallen as installed system prices for solar plummeted by 66 percent from 2006 to mid-2012.[132] Meanwhile, in contrast, 9 out of 10 European coal and gas plants are losing money.[133]

Supportive legislation has incentivized the transition: the Renewable Energy Act guarantees priority grid access to all electricity generated from renewables.

Renewable energy costs are also becoming more competitive with fossil fuels globally. Solar energy generation costs have dropped massively over the past 25 years,[134] and solar panel installation reached record highs in 2013, as costs remained low.[135] Market analysts are suggesting that this trend will begin to challenge fossil fuel dominance within the next decade: McKinsey has suggested that projected price decreases over coming years will put solar power 'within striking distance' of coal. Even Saudi Arabia is embracing solar power generation – investing more than $100bn in 41 gigawatts of capacity; enough to cover 30 percent of its power needs by 2030.[136] These changing market dynamics partly account for the fact that 2013 was the first year in which China invested more in renewable energy than the whole of Europe – investing $56bn to Europe's $48bn.[137]

Box 5: Unstoppable solar

Across Australia more than 1.2 million rooftop solar systems are producing over 3 gigawatts of energy from rooftop solar. In Queensland alone, more than 350,000 buildings are generating electricity from solar at almost no cost, and others are catching on. In fact nearly 4,000 households per month are seeking permission to fix panels onto their roofs.[138] Some analysts are suggesting that Australian households will invest $30bn of their own money into solar in coming decades, regardless of national energy policy.[139]

In the US over the last decade, solar technology, especially photovoltaic solar, has experienced rapid growth, accounting for 30 percent of new renewable energy capacity.[140] American homes, hospitals and other buildings, from Arizona and Hawaii to California, are generating increasingly large proportions of solar energy from the rooftops.[141] Analysis suggests that more than half of all US homebuilders are expected to offer solar energy systems as an option in new single-family homes by 2016.

JOBS AND EMPLOYMENT

The economic benefits from the increased employment created by an energy transition are considerable. UNEP has estimated that the solar and wind energy sectors globally could create 6.3 million and 2.1 million jobs respectively, by 2030. The European Commission estimates that even a modest 30 percent renewable-energy target flanked with energy efficiency measures would create 568,000 additional jobs in the EU by 2030. In the US, a combination of public investment and tax incentives for green buildings could also generate close to one million jobs.[142]

Even a modest 30 percent renewable-energy target, with energy efficiency measures, could create 568,000 additional jobs in the EU by 2030.

Analysis has long shown that renewables are often more 'job-intensive' than fossil fuels.[143] Distributed off-grid technologies require large manufacturing bases for the components, as well as sales, installation and maintenance, all of which are highly labour intensive. Some studies show that in the US, three times as many jobs could be created by renewable energy than by fossil fuels[144] and that for every $1m invested in the US, solar and wind energy create 14 and 13 jobs compared with just 5 and 7 for natural gas and coal, respectively.[145] According to the Solar Foundation, the industry created almost 14,000 new jobs in the US between 2011 and 2012.[146] In Germany, there are now in excess of 400,000 workers in the clean energy industry – exceeding the number in the dirty fossil fuel industry they have replaced.[147]

In the US, 3 times as many jobs could be created by renewable energy than by fossil fuels, according to some studies.

China is the largest employer in the renewable energy sector. In 2013, an estimated 1.6 million people were employed in the Chinese solar photovoltaic value chain.[148] In Bangladesh, in the last decade, the number of solar systems has soared from 25,000 to 2.8 million, resulting in 114,000 jobs during 2013.[149]

In 2013, an estimated 1.6 million people were employed in Chinese solar photovoltaic value chain.

By contrast, fossil fuel projects are by and large highly mechanized following construction, requiring little actual labour. Claims that the American Keystone XL pipeline would create 20,000 jobs were vastly exaggerated, with a recent State Department review placing the real

number of jobs at just 35.[150] Furthermore, a review by the Democratic Natural Resources Committee in the US found that, despite generating $546bn in profits between 2005 and 2010, ExxonMobil, Chevron, Shell, and BP combined reduced their US workforce by 11,200 over the same period.[151]

ENERGY ACCESS

Currently 1.3 billion people globally have no access to electricity and are among the poorest and most marginalized. In sub-Saharan Africa, 70 percent of the population have no access to electricity, which means that 30 percent of health facilities have no energy access, 50 percent of vaccines are ruined due to lack of refrigeration, and 65 percent of schools have no electricity source.[152]

Energy is central to sustainable development and poverty reduction efforts as it affects social, economic and environmental aspects of life. Energy supports agricultural productivity, access to water, essential services delivery including health and education, and livelihoods.[153] Energy use will need to triple if sub-Saharan Africa is to achieve universal energy access – and given the often negligible carbon emissions of countries in this region, African countries may need to make use of fossil fuels for immediate social and economic needs.

70% of the population of sub-Saharan Africa have no access to electricity: so 30% of health facilities have no energy access; 50% of vaccines are ruined due to lack of refrigeration; and 65% of schools have no electricity source.

Yet in some situations, opportunities exist in developing countries to leap-frog carbon-intensive energy provision and build their development on renewable sources of energy wherever they can – especially if aided by the required climate finance from richer nations. Advancing low carbon development is particularly important in an energy-insecure world, where continued reliance on increasingly expensive imported fossil fuels puts huge pressure on already constrained government and household budgets. Importantly, expanding energy access through renewable and decentralized technologies can be both cheaper and more suitable – especially for reaching marginalized areas.

Analysis has shown that powering a hospital costs less than half as much through solar PV than through diesel power generators, and that schools can save as much as 60 percent on energy bills through switching from diesel to wind power.[154] Renewables can also provide a more reliable and less costly energy source for productive uses such as farming and agriculture – for example, by reducing reliance on diesel generators for water pumping that are expensive and prone to breakdown. Many African countries are already beginning to seize these opportunities – growth in off-grid solar has provided 2.5 million homes with electricity in Kenya.

Powering a hospital can cost less than half as much by solar PV than diesel power generators, and schools can save as much as 60% on energy bills through switching from diesel to wind power.

Box 6: Solar for water in Kenya

In partnership with Oxfam, three villages across Wajir County (Batalu, Abakore and Arbajahan) in Kenya switched from diesel to solar-powered water pumping systems in 2013. The largest of these is capable of pumping 150 cubic metres of water per day (equivalent to 20 litres of water/person/day for a population of 7,500). Preliminary analysis indicates that the investment cost of upgrading to solar in each of these villages will have paid for itself in fuel savings alone in two to three years.

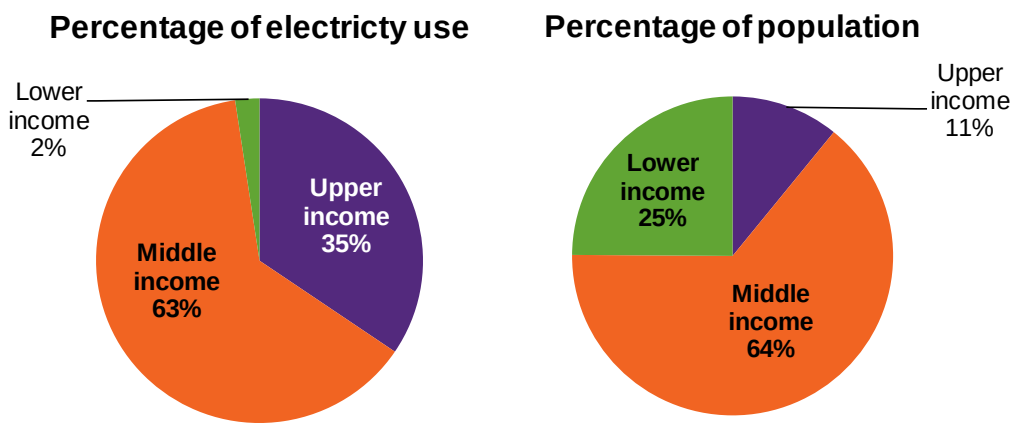
The reduction in the cost of solar panels makes it a much more attractive power source for the large pumps prevalent across Wajir (5–15KW). Oxfam's pilot work has demonstrated that the cost benefits are indisputable. The villages are now saving between 475,000 and 1.825 million Kenyan Shillings on fuel every year. These cost savings are even more significant when factoring in the much higher operation and maintenance costs of diesel generators, which are prone to breakdown and require qualified mechanics to repair.

Source: Oxfam Kenya

While fossil fuel-based power generation can be an option to improve energy access in urban areas, including for poorer communities, it is far less suitable for rural energy provision. Extending centralized grid infrastructure into rural areas is both logistically difficult and extremely costly to establish and maintain – and therefore often not prioritized by the government. For example, South Africa generates most of its energy through centralized coal-fired power facilities, which are less likely to reach marginalized areas.[155] As a result, even though upper-income households constitute only 10.9 percent of the population, they account for 34.4 percent of electricity usage as they are more likely to live in urban, grid-connected areas. Conversely, low-income households constitute 24.9 percent of the population but account for just 2.4 percent of energy consumption, as they are more likely to be in areas that traditional grid-based systems do not reach (see Figure 3).

Although upper-income households constitute only 10.9% of the population, they account for 34.4% of electricity usage as they are more likely to live in urban, grid-connected areas.

Figure 3: Electricity use in South Africa by household income groups



Source: Adapted from http://www.erc.uct.ac.za/Research/publications/12Tait-Winkler-Emissions.pdf

To reach many of the rural communities that currently lack access to energy, decentralized off-grid and mini-grid renewable energy technologies are both more affordable and more practical. The IEA has estimated that, in order to provide for the 1.3 billion people globally currently lacking access to energy, approximately 65 percent of electricity needs will need to come from renewable energy sources such as solar, wind, biomass and micro-hydro.[156] Recent analysis by the Sierra Club further suggests that the significant cost benefits of off-grid clean energy can be enhanced even further by utilizing the current energy efficiency technologies available – leading to 50–85 percent less energy input, thereby dramatically reducing capital expenditure and in turn creating a $12bn annual market by 2030.[157]

In order to provide for the 1.3 billion people globally currently lacking access to energy, around 65% of electricity needs will need to come from renewable energy sources such as solar, wind, biomass and micro-hydro.

The combination of increased affordability and better suitability of renewables – especially for rural areas – accounts for recent efforts by developing country governments to use renewables to enhance energy access. For example, Peru is aiming to raise the national electrification rate from 87 to 95 percent, and as part of this drive issued a tender for 500,000 photovoltaic systems in 2013.[158] This trend of pledges for solar expansion is also evident in India where around 400 million people lack access to electricity. Prime Minister Narenda Modi is pledging to harness solar power to enable every home to run at least one light bulb by 2019.[159]

In terms of actual implementation, Bangladesh is now home to a huge 2.9 million off-grid solar home systems,[160] and every single month the country pumps out 80,000 new installations. The World Bank has loaned the Bangladesh government $78m to install an additional 480,000 solar home systems for areas without grid access to electricity.[161]

CONCLUSION AND RECOMMENDATIONS

If fossil fuel use globally continues unabated, severe climate change impacts on the poorest people will be unavoidable. Despite apparent global aspirations to keep global warming below 2ºC – and associated commitments from a range of countries – so far this has not been sufficient to achieve the necessary financial shift away from fossil fuels and into clean energy alternatives. Progress has been further hampered by ongoing public subsidies and tax breaks which 'de-risk' fossil fuel investment, as well as consistent lobbying by the fossil fuel industry to block climate legislation and protect its bottom line. This 'toxic triangle' of political inertia, financial short-termism and vested fossil fuel interests must be broken if the world is to seize the multiple opportunities – in rich and poor countries alike – for a low-carbon transition.

Rich developed nations must move first and fastest to rapidly reduce emissions and shift away from fossil fuels. With the most significant historic responsibility for climate change and the greatest capacity to act, they have no excuse for any further delay. However, even with the rapid and required moves by rich countries, the reality of the limited remaining 'atmospheric space' and the risk this poses to the poorest people globally means that developing countries must also be part of collective efforts – with the highest emitting countries and richer among them moving faster. Those countries with relatively lower responsibility for emissions, and less capacity to pay, must be assisted financially in any transition, while retaining a fair share of carbon space to exploit fossil fuels where necessary for immediate social and economic needs. To this end, governments globally must agree a fair, equitable and legally binding deal in Paris in 2015, and rich country governments must urgently scale up global public climate finance – in the first instance, to meet the existing commitment to provide $100bn per year by 2020 – to help poorer countries mitigate and adapt to climate change, and put in place ambitious commitments for post-2020 climate finance in Paris in 2015.

RECOMMENDATIONS

To avoid climate catastrophe and harness finance for a clean energy future, Oxfam proposes that governments must:

- Commit to a long-term global goal of phasing out fossil fuel emissions – and phasing in sustainable, renewable alternatives, by early in the second half of this century, with rich developed countries leading the way and providing the necessary support to developing countries to follow.
- Shift public finance away from fossil fuels, by embarking on reforms that shift public investment from the fossil fuel industry to energy efficiency and sustainable renewables, ensuring protections are in place for the poorest people;
- Mandate the fossil fuel and energy-intensive industries to disclose all spending on lobbying activities, and introduce full transparency and disclosure of any interaction between public institutions and those lobbying on behalf of these industries (where such requirements do not exist already);
- Commit to making global finance work for a low-carbon future, by reviewing climate risk in the financial system, and through introducing regulations and incentives to shift finance away from fossil fuels and into sustainable alternatives.

Governments cannot act alone; the private sector – and specifically companies and investors – must also step up by taking the following actions:

- Companies must disclose the carbon emissions embedded in their operations and across their supply chains so that investors can better assess climate risk;
- Oil, gas and mining companies must fully comply with laws in the US and EU that require disclosure of payments from these companies to host governments for the extraction of these resources;
- Companies whose future viability is threatened by climate change – such as the food and beverage industries – should call for ambitious global action to tackle climate change, call on governments to shift conditions that favour the fossil fuel industry, and challenge companies benefiting from the status quo including the fossil fuel industry and its lobbyists;
- Investors must commit to factoring climate risk in all investments – including risks posed by both climate change and climate legislation – challenging those companies that are pursuing costly high-carbon strategies;
- Investors should shift finance out of fossil fuels, committing to a timetable to phase out carbon-intensive investments and redistribute funds to low-carbon development, starting with dirtiest fossil fuels – coal and unconventional fossil fuels;

- The fossil fuel and energy-intensive industries should plan to radically change and diversify their business models to embrace a low-carbon future and stop funding efforts to undermine climate legislation.

NOTES

All links were last accessed in July 2014 unless otherwise specified

1 Carbon Tracker Initiative and The Grantham Research Institute, LSE (2013) 'Unburnable Carbon: Wasted capital and stranded assets', http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/PB-unburnable-carbon-2013-wasted-capital-stranded-assets.pdf

2 K. Anderson and D. Calverley (2014) 'Avoiding dangerous climate change: choosing the science of the possible over the politics of the impossible'. A report commissioned by Oxfam and undertaken by Tyndall Centre researchers.

Much of the analysis relies on research within: K. Anderson and A. Bows (2011) 'Beyond dangerous climate change: emission pathways for a new world', Philosophical Transactions of the Royal Society A, 369, 20–44, DOI:10.1098/rsta.2010.0290.

3 M. New et al. (2011) 'Migration and Global Environmental Change: The possible impacts of high levels of climate change in 2060 and implications for migration', UK Government Office for Science, http://kevinanderson.info/blog/wp-content/uploads/2013/02/Impact-high-levels-climate-change-2060-for-migration2.pdf

4 G.C. Nelson, M.W. Rosegrant, J. Koo, R. Robertson, T. Sulser, T. Zhu, C. Ringler, S. Msangi, A. Palazzo, M. Batka, M. Magalhaes, R. Valmonte-Santos, M. Ewing and D. Lee (2009) 'Climate Change: Impact on Agriculture and Costs of Adaptation', Washington DC: International Food Policy Research Institute, http://www.ifpri.org/sites/default/files/publications/pr21.pdf; data for under-five populations of USA and Canada from UNICEF's statistical tables, http://www.unicef.org/statistics/index_24183.html

5 S. Yeo (2014)'Climate action is "only way" to grow economy – Unilever CEO', Responding to Climate Change, 14 April 2014, http://www.rtcc.org/2014/04/08/climate-action-is-only-way-to-grow-economy-unilever-ceo/

6 Rich countries for the purposes of this paper refer to Annex 1 countries as defined by the UN Framework Convention on Climate Change http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php

7 J. Leaton (2013) 'Unburnable Carbon 2013: Wasted Capital and Stranded Assets, p5, http://carbontracker.live.kiln.it/Unburnable-Carbon-2-Web-Version.pdf

8 Carbon Tracker Initiative and The Grantham Research Institute, LSE, *op. cit*.

9 International Monetary Fund (IMF) (2013) 'Energy Subsidy Reform: Lessons and Implications', http://www.imf.org/external/np/pp/eng/2013/012813.pdf

10 International Energy Agency (IEA) (2012) 'CO2 Emissions from Fuel Combustion: Highlights', http://www.iea.org/co2highlights/co2highlights.pdf

11 Carbon Tracker Initiative and The Grantham Research Institute, LSE, *op. cit.*

12 K. Anderson and D. Calverley *op. cit.*

13 B.M. Sanderson, B.C. O'Neill, J.T. Kiehl, G.A. Meehl, R. Knutti and W.M. Washington (2011). 'The response of the climate system to very high greenhouse gas emission scenarios', *Environmental Research Letters* 6(3): 034005.

14 T. Sanford, P.C. Frumhoff, A. Luers and J. Gulledge (2014) 'The climate policy narrative for a dangerously warming world', *Nature Climate Change* 4, 164–6.

15 World Bank (2013) 'What Climate Change Means for Africa, Asia and the Coastal Poor', http://www.worldbank.org/en/news/feature/2013/06/19/what-climate-change-means-africa-asia-coastal-poor

16 K. Anderson and D. Calverley *op. cit.;* Prof Kevin Anderson, Dr John Broderick and Dr Maria Sharmina (2014) 'Climate Change under Fossil Intensive Development', Oxford: Oxfam GB, p. 12. Research Briefing commissioned by Oxfam GB. References New et al. (2011)

17 G.C. Nelson, et al. (2009) op. cit.

Data for under-five populations of USA and Canada from UNICEF's statistical tables, http://www.unicef.org/statistics/index_24183.html

18 M.B. Burke, D.B. Lobell and L. Guarino (2009) 'Shifts in African crop climates by 2050, and the implications for crop improvement and genetic resources conservation', *Global Environmental Change – Human and Policy Dimensions* 19(3): 317–25.

19 Intergovernmental Panel on Climate Change, (2014) 'Working Group II, Assessment Report 5, Chapter 7', p.3, http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap7_FGDall.pdf .

20 P.K. Thornton, P.G. Jones, P.J. Ericksen, and A.J. Challinor, (2011)' Agriculture and food systems in sub-Saharan Africa in a 4 degrees C+ world'. *Philosophical Transactions of the Royal Society A – Mathematical Physical and Engineering Sciences* 369(1934): 117–36.

21 Intergovernmental Panel on Climate Change *op. cit.* p. 7.

22 Intergovernmental Panel on Climate Change op cit, p 3

23 *The Economist* (2013b) 'Thought for food', 12 March, http://www.economist.com/blogs/graphicdetail/2013/03/daily-chart-5

24 N. Hossian, R. King and A. Kelbert (2013) 'Squeezed: Life in a Time of Food Price Volatility, Year 1 results', Oxfam research report, http://policy-practice.oxfam.org.uk/publications/squeezed-life-in-a-time-of-food-price-volatility-year-1-results-292412

25 Risky Business Project(2014) 'Risky Business: The Economic Risks of Climate Change in the United States – Executive summary', http://riskybusiness.org/report/overview/executive-summary

26 The Economics of Climate Change in the Pacific ', http://www.adb.org/sites/default/files/economics-climate-change-pacific-brochure.pdf

27 Christian Aid (2009) 'The Economic Cost of Climate Change in Africa', http://www.christianaid.org.uk/images/economic-cost-of-climate-change-in-africa.pdf

28 M. Reilly and N. Halter (2014) 'General Mills blames winter for lower sales', *the Minneapolis/St. Paul Business Journal*, 19 March, http://www.bizjournals.com/twincities/morning_roundup/2014/03/general-mills-blames-winter-for-lower-sales.html

29 S. Yeo (2014) *op. cit*.

30 T. Maynard (2014) 'Extreme weather is a reality – the insurance industry must adapt', *Guardian Professional*, January 31, http://www.theguardian.com/sustainable-business/extreme-weather-insurance-industry-climate-change

31 AIG (2013) 'Climate Change: A Call for Weatherproofing the Insurance Industry', http://www.aig.com/Chartis/internet/US/en/IPG percent20Real percent20Estate percent20Climate percent20Change percent20Paper_tcm3171-488915.pdf

32 *Ibid.*

33 S&P Capital IQ (2014) 'Climate Change Is A Global Mega-Trend For Sovereign Risk', https://www.globalcreditportal.com/ratingsdirect/renderArticle.do?articleId=1318252&SctArtId=236925

34 The World Health Organization's Factsheet on Air Quality and Health

http://www.who.int/mediacentre/factsheets/fs313/en/

35 Health and Environment Alliance and Bankwatch (2013) 'How coal power plants make us sick – Romanian version of HEAL report launched today', 9 December 2013, http://www.env-health.org/IMG/pdf/press_release_09_12_2013_final_lm_jh.pdf

36 *Iibid*.

37 L. Myllyvirta (2013) 'Silent Killers: Why Europe Must Replace Coal Power with Green Energy', http://www.greenpeace.org/international/Global/international/publications/climate/2013/Silent-Killers.pdf

38 *Ibid.*

39 C. Ottery (2013) 'Interactive Map: Health impact of China's coal plants mapped', Energydesk, Greenpeace, 12 December 2013, http://www.greenpeace.org.uk/newsdesk/energy/data/interactive-health-impact-chinas-coal-plants-mapped

40 D. Goenka and S. Guttikunda (2013) 'Coal Kills: An Assessment of Death and Disease caused by India's Dirtiest Energy Source', Mumbai: Conservation Action Trust, Urban Emissions and Greenpeace India, http://www.greenpeace.org/india/Global/india/report/Coal_Kills.pdf

41 http://newclimateeconomy.report/overview/

42 UN News Centre (2012)'Open-pit coal mine project in Bangladesh threatens human rights – UN experts', UN, 28 February 2012, http://www.un.org/apps/news/story.asp?NewsID=41398#.U8-dH2RDsm8

43 *Ibid.*

44 Human Rights Watch (2013) 'What is a House without Food?

Mozambique's Coal Mining Boom and Resettlements', http://www.hrw.org/sites/default/files/reports/mozambique0513_Upload_0.pdf

45 Theodore Downing (2014) 'Does the Kosovo Power Project's Proposed Forced Displacement of Kosovars Comply with International Involuntary Resettlement Standards?', http://action.sierraclub.org/site/DocServer/Final_Draft_Downing_Involuntary_Resettlement_at_KPP_Repo.pdf?docID=15541

46 E.ON (2011) 'Counter-Motions and Electoral Proposals for the E.ON 2011 Annual Shareholders Meeting', p. 2,

http://www.eon.com/content/dam/eon-com/en/downloads/e/EON_Counter_motion_Election_Proposal__2011.pdf

47 D. Rømer Adamsen, A.S. Pulsen, M. Urban Swart (2010) 'The Curse of Coal: Our coal consumption causes diseases, pollution, and poverty in Colombia.', Danwatch, http://www.multiwatch.ch/cm_data/100505_danwatch_cerrejon.pdf

48 Many of these communities have received inadequate compensation for resettlement. World Development Movement (2013) 'The Cerrejón Mine: Coal Exploitation in Colombia', Campaign briefing, http://www.wdm.org.uk/sites/default/files/cerrejon_media_briefing.pdf

49 European Commission 2030 Framework for Climate and Energy Policies http://ec.europa.eu/clima/policies/2030/index_en.htm

50 Tom McCarthy (2014) 'Obama says carbon pollution caps will "protect health of vulnerable" – as it happened', the *Guardian*, 2 June,

http://www.theguardian.com/environment/2014/jun/02/obama-climate-change-carbon-emissions-live

51 Kathy Chen And Stian Reklev (2014) 'China plans absolute CO2 cap from 2016', *Reuters*, 3 June, http://uk.reuters.com/article/2014/06/03/china-climatechange-idUKT9N0NH02W20140603

52 IPCC (2014) 'Summary for Policymakers', in O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.) Climate Change 2014, Mitigation of Climate Change: Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge: Cambridge University Press, p13, http://report.mitigation2014.org/spm/ipcc_wg3_ar5_summary-for-policymakers_approved.pdf

53 *Ibid.*

54 Anderson and Caverley, *op. cit.*

55 Research commissioned by the European Commission found that oil derived from tar sands is 23% more carbon intensive than conventional oil.

Transport and Environment (2013) 'A Fact-Finding Trip to the Core of the Fuel Quality Directive', http://www.transportenvironment.org/sites/te/files/publications/Tarsands_briefing_T%26E_final.pdf

56 Rachel Nuwer (2013) 'Oil Sands Mining Uses Up Almost as Much Energy as It Produces', *Inside Climate News*, 19 February, http://insideclimatenews.org/news/20130219/oil-sands-mining-tar-sands-alberta-canada-energy-return-on-investment-eroi-natural-gas-in-situ-dilbit-bitumen

57 Lenore Taylor (2014) 'Australia kills off carbon tax' the *Guardian*, 17 July, http://www.theguardian.com/environment/2014/jul/17/australia-kills-off-carbon-tax

58 World Bank Data on CO_2 Emissions, http://data.worldbank.org/indicator/EN.ATM.CO2E.PC?display=map

59 International energy Outlook (2014) 'U.S. Energy Information Administration', http://www.eia.gov/forecasts/ieo/pdf/0484(2013).pdf

60 K. Anderson and A. Bows (2011) 'Beyond dangerous climate change: emission pathways for a new world', *Philosophical Transactions of the Royal Society A*, 369, 20–44, DOI:10.1098/rsta.2010.0290.

61 James Leaton (2012) 'Unburnable Carbon – Are the World's Financial Markets Carrying a Carbon Bubble?', http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf

62 IHS energy 50 – The Definitive Annual Ranking of the World's Largest Listed Energy Companies, January 2014, http://cdn.ihs.com/www/energy50/IHS-Energy-50-Final-2014.pdf

63 Oxfam's calculations are based on data collected via Reuters' Thomson One financial database in May 2014, using the combined figures for equity ownership (as of May 2014), as well as bond underwriting and arranging/participating in loans since the beginning of 2013. Data for each parent company also includes all subsidiary data, where it is available. For bank loans, 'arrangers' are assumed to put forward 40 per cent of the total

loan amount, with other participants assumed to provide the remaining 60 per cent. For underwriting, 'bookrunners' are assumed to put forward three-quarters of the financing, with other participants providing the remaining quarter.

The exact figures are: $6.397bn and $3.634bn.

64 Data from Reuters' Thomson One database, taken in May 2014 – see previous note.

65 Leaton (2013) 'Unburnable Carbon 2013: Wasted Capital and Stranded Assets, p5, http://carbontracker.live.kiln.it/Unburnable-Carbon-2-Web-Version.pdf

66 International Energy Agency – World Energy Investment Outlook 2014 Factsheet:

Fossil Fuels http://www.worldenergyoutlook.org/media/weowebsite/2014/weio/WEIO2014FactSheet2FossilFuels.pdf

67 F and C Investments (2013) 'Responsible Investment Report 2013', www.fandc.com/documents/responsible-investment-report-2013/

68 A. Blackburne (2013) 'Norwegian pension fund divests from "financially worthless" fossil fuel firms', *Blue & Green Tomorrow*, 5 July, http://blueandgreentomorrow.com/2013/07/05/norwegian-pension-fund-divests-from-financially-worthless-fossil-fuels/

69 S. Rundell (2013) 'AP4 retreats from carbon', *Top1000funds.com*, 11 October, http://www.top1000funds.com/profile/2013/10/11/ap4-retreats-from-carbon/

See also Fjärde AP-Fonden (2013) 'AP4 investing in lower emissions in emerging markets', http://www.mynewsdesk.com/se/fjarde_ap-fonden/pressreleases/ap4-investing-in-lower-emissions-in-emerging-markets-914131

70 ASN Bank (2013) 'Our Vision on Climate Change, A Liveable Planet for Everyone'.

71 John Schwartz (2014) 'Rockerfellers, Heirs to an Oil Fortune, will Divest Charity of Fossil Fuels' http://www.nytimes.com/2014/09/22/us/heirs-to-an-oil-fortune-join-the-divestment-drive.html?_r=1

72 UNEP New Centre, 'United Nations and Leading Investors launch Coalition to decarbonize Institutional Investment Worldwide at UN Summit http://www.unep.org/newscentre/Default.aspx?DocumentID=2796&ArticleID=10991&l=en

73 J Leaton (2013) op. cit.

74 FTSE Data as of 31 July 2014,

http://www.ftse.com/Analytics/FactSheets/Home/DownloadSingleIssue?issueName=UKX

75 S&P Data as of 3 July 2014,

http://us.spindices.com/

76 R. Revesz (2013) 'Why Pension Funds Won't Allocate 90 Percent To Passives', ETF.com, 27 November, http://europe.etf.com/blog/9450-why-pension-funds-wont-allocate-90-percent-to-passives.html

77 The Law Commission's Fiduciary Duties of Investment Intermediaries,

http://lawcommission.justice.gov.uk/areas/fiduciary_duties.htm

78 IEA (2013) 'World Energy Outlook 2013 Factsheet: How will global energy markets evolve to 2035?', http://www.iea.org/media/files/WEO2013_factsheets.pdf

79 IMF (2013) 'Energy Subsidy Reform: Lessons and Implications', http://www.imf.org/external/np/pp/eng/2013/012813.pdf

80 Shakuntala Makhijani, with assistance and contributions from Stephen Kretzmann and Elizabeth Bast (2014) 'Cashing in on All of the Above: U.S. Fossil Fuel Production Subsidies under Obama', http://priceofoil.org/content/uploads/2014/07/OCI_US_FF_Subsidies_Final_Screen.pdf

81 *Ibid.*

82 *Ibid.*

83 *Ibid.*

84 http://www.argusmedia.com/pages/NewsBody.aspx?id=899088&menu=yes

85 Friends of the Earth (2013) 'UK Fossil Fuel Tax Breaks, 2012/13', http://www.foe.co.uk/sites/default/files/downloads/uk_fossil_fuel_tax_breaks.pdf

86 Guy Chazan, (2013) 'Record investment planned for North Sea', *Financial* Times, 12 April, http://www.ft.com/cms/s/0/be4f240a-a2bf-11e2-bd45-00144feabdc0.html

87 Business Green 'Budget 2014: Osborne's carbon price freeze sparks green investment fears',

http://www.businessgreen.com/bg/news/2335174/budget-2014-osbornes-carbon-price-freeze-sparks-green-investment-fears

88 Guy Chazan (2013) 'Autumn Statement 2013: Tax break to boost shale gas delivery', *Financial Times*, 5 December, http://www.ft.com/cms/s/0/782b65ac-5da8-11e3-95bd-00144feabdc0.html#axzz38QKsRCoz and https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/264650/PU1580__final_.pdf

89 See the Federal Government's 'Accelerated Capital Cost Allowance', http://www.oecd.org/site/tadffss/CAN.pdf, and can't find date oecd

Canada: InventoryoOf Estimated Budgetary Support and Tax Expenditures for Fossil-Fuels,

http://www.oecd.org/site/tadffss/CANdata.xls

90 Steven Herz (2014) @Ecologists stop "back door" financing for new coal power stations!', *The* Ecologist, 11 June, http://www.theecologist.org/blogs_and_comments/commentators/2432729/stop_back_door_financing_for_new_coal_power_stations.html

91 Shakuntala Mmakhijani with Stephen Kretzmann and Elizabeth Bast, *op.cit.*

92 European Commission (2013) 'EU Energy, Transport and GHG Emissions - Trends to 2050-Reference Scenario 2013', p.17 http://ec.europa.eu/transport/media/publications/doc/trends-to-2050-update-2013.pdf

European Commission (2014) 'Commission Staff Working Document – In-depth Study of European Energy Security European Commission June 2014', p.201, http://ec.europa.eu/energy/doc/20140528_energy_security_study.pdf

93 T. Boβmann, W. Eichhammer and R. Elsland (2012) 'Concrete Paths of the European Union to the 2ºC Scenario:Achieving the Climate Protection Targets of the EU by 2050 through Structural Change, Energy Savings and Energy Efficiency Technologies', Fraunhofer Institute for Systems and Innovation Research ISI, http://www.isi.fraunhofer.de/isi-wAssets/docs/e/de/publikationen/Begleitbericht_Contribution-to-climate-protection_final.pdf

94 J. Arze del Granado, D. Coady and R. Gillingham (2010) 'The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries', IMF Working Paper, http://www.imf.org/external/pubs/ft/wp/2010/wp10202.pdf

95 IMF (2013) 'Energy Subsidy Reform: Lessons and Implications', http://www.imf.org/external/np/pp/eng/2013/012813.pdf

96 S. Whitley (2013) 'Time to Change the Game: Fossil Fuel Subsidies and Climate', Overseas Development Institute, http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8668.pdf

97 *Ibid.*

98 http://www.shiftthesubsidies.org/

99 ClimateWorks Foundation and the World Bank Group (2014) 'Climate-Smart Development: Adding up the benefits of actions that help build prosperity, end poverty and combat climate change, Executive Summary', http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/06/20/000456286_20140620101332/Rendered/PDF/889080WP0v20Bo00Development0Summary.pdf

100 IMF (2013) *op. cit*.

101 World Economic Forum (2013) 'Lessons Drawn from Reforms of Energy Subsidies', http://www3.weforum.org/docs/GAC13/WEF_GAC13_LessonsReformsEnergySubsidies_Report.pdf

102 D. Guillaume, R. Zytek and M. Reza Farzin (2011) 'Iran – The Chronicles of the Subsidy Reform', IMF Working Paper, http://www.imf.org/external/pubs/ft/wp/2011/wp11167.pdf

103 R. Heede (2014) 'Carbon Majors: Accounting for Carbon and Methane Emissions 1854-2010, Methods and Results Report', Climate Mitigation Services, http://www.climateaccountability.org/pdf/MRR percent209.1 percent20Apr14R.pdf

104 D.J. Weiss and M. Peterson (2014) 'With only $93 billion in profits, the big five oil companies demand to keep tax breaks', Center for American Progress, http://americanprogress.org/issues/green/news/2014/02/10/83879/with-only-93-billion-in--profits-the-big-five-oil-companies-demand-to-keep-tax-breaks/

105 Peabody Energy (n.d.) 'Advocating Coal's Role in Alleviating Energy Poverty to World Energy Ministers', http://www.peabodyenergy.com/content/491/Advocating-Coals-Role-Alleviating-Energy-Poverty-to-the-Worlds-Energy-Ministers

106 This figure is based on Oxfam's own research using the EU transparency register and its search tools to determine the total declared spending from the fossil fuel industry. It is a conservative estimate based on the figures available, which only give an indication of the scale of spending, as declaring them to the European Transparency Register is voluntary.

This includes downstream industries such as refineries, distributors, pipeline companies, and fuel oil dealers, and their sectoral trade associations. This is likely to underestimate total lobby expenditure, as – due to the register's voluntary nature – there are many gaps, and where companies do report, there are different interpretations of what constitutes lobbying. The overall total includes companies' declared spending, and trade association spending (but not consultancy spending, as it is assumed that the rules are followed and this is already covered in company declarations). Business associations that cover many different sectors (e.g. CBI, Business Europe) have not been included as there is no breakdown of their spending by policy area. Not all companies have reported figures for the 2013–14 financial year, so the figure for the latest reported year has been taken. Where companies have only reported figures for part of the financial year, the equivalent yearly spend has been calculated, and where figures have been expressed in a bracket, the top-end of the bracket has been taken. http://ec.europa.eu/transparencyregister/info/homePage.do

107 The exact figure is $156,673,386.

108 Information from the Centre for Responsive politics (based on Senate Office of Public Records filings). Figures for the upstream and downstream oil and gas industry are available here: http://www.opensecrets.org/lobby/indusclient.php?id=E01&year=2013, and figures for the coal mining industry are available here: http://www.opensecrets.org/lobby/induscode.php?id=E1210&year=2013

109 In the US, the top two spending oil giants spent more than the entire alternative energy sector combined. Exxon and Chevron spent $24m between them in 2013, whereas the whole alternative energy sector spent $21.7m on lobbying in the same year. Source: http://www.opensecrets.org/industries/lobbying.php?ind=E1500http://www.opensecrets.org/lobby/induscode.php?id=E1500&year=2013Oxfam calculations.

110 The estimated costs to fund one negotiator from every developing country to attend one two-week session of the climate negotiations comes to a total of €950,000.

111 UN Framework Convention on Climate Change (2013) 'Conference of the Parties: Programme budget for the biennium 2014–2015', http://unfccc.int/resource/docs/2013/cop19/eng/l07.pdf

'Developing' country means those countries with a per capita GDP below $7,500 in 2007 (with a higher ceiling of $14,000 for small-island developing states).

112 E. Gogoi (2014) 'Flooding in Nepal: will the economy survive the deluge?', *Guardian Professional*, 16 June, http://www.theguardian.com/global-development-professionals-network/2014/jun/16/nepal-climate-change-economic-research

113 The EU Fuel Quality Directive, http://ec.europa.eu/environment/air/transport/fuel.htm

114 Background documents at http://climateactionnetwork.ca/wp-content/uploads/2012/02/2011-05-24-Pan-European-Oil-Sands-Team-Backgrounder.pdf

and Climate Action Network Canada (2012) 'Dirty Oil Diplomacy: The Canadian government's global push to sell the tar sands', http://climateactionnetwork.ca/wp-content/uploads/2012/03/CAN_Dirty_Oil_Diplomacy.pdf

115 Doing Business in Canada – Useful Links http://www.canada.doingbusinessguide.co.uk/resources-useful-links/

116 Damien Carrington (2011) 'UK secretly helping Canada push its oil sands project' the *Guardian*, 27 November, http://www.theguardian.com/environment/2011/nov/27/canada-oil-sands-uk-backing

and Lorna Howarth (2013) 'Leaked papers show UK government will backtrack on tar sands extraction being classified as highly polluting' *The Ecologist*, 17 May,http://www.theecologist.org/News/news_analysis/1928187/leaked_papers_show_uk_government_will_backtrack_on_tar_sands_extraction_being_classified_as_highly_polluting.html

117 http://www.theguardian.com/environment/2013/may/15/uk-signals-support-eu-import-tar-sands and http://www.greenpeace.org.uk/sites/files/gpuk/FCO-eGram.pdf

118 ClimateWorks Foundation and the World Bank Group (2014) 'Climate-Smart Development: Adding up the benefits of actions that help build prosperity, end poverty and combat climate change, Executive Summary', http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/06/20/000456286_20140620101332/Rendered/PDF/889080WP0v20Bo00Development0Summary.pdf

119 IEA (2014) 'Energy Technology Perspectives 2014: Harnessing Electricity's Potential, Executive Summary', http://www.iea.org/Textbase/npsum/ETP2014SUM.pdf

120 L. Ryan and N. Campbell (2012) 'Spreading the Net: The Multiple Benefits of Energy Efficiency Improvements', International Energy Agency Insights Paper, http://www.iea.org/publications/insights/insightpublications/Spreading_the_Net.pdf

121 IEA (2011) 'The world is locking itself into an unsustainable energy future which would

have far-reaching consequences, IEA warns in its latest World Energy Outlook', 9 November, http://www.iea.org/newsroomandevents/pressreleases/2011/november/name,20318,en.html

122 A. Bowen and S. Fankhauser (2011) 'Low-Carbon development for the Least Developed Countries', *World Economics* 12(1):145–62, esp. p.148, http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2011/01/low-carbon-development_Bower-Fankhauser.pdf

123 IEA (2014) *op. cit*.

124 European commission (2014), *op.cit.*

125 *Ibid.*

Only a small percentage of this was biomass.

126 The latest Eurostat population figure is 506 million: Eurostat (2014) Population on 1 January', http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tps00001&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

127 Total oil imports from Russia in 2013 amounted to $122 billion. European Commission (2014b) _Energy: Market observatory and Statistics, EU Crude oil imports', http://ec.europa.eu/energy/observatory/oil/import_export_en.htm Using the average US Federal Reserve exchange rate for 2013, and with an EU population of 506 million, this works out at about €182 per capita. Total gas imports from Russia amounted to 41 percent of the overall 2013 €87 billion import bill, European Commission (2014), *op. cit.*. This works out at about €70 per person. Total = €252 per person for 2013

128 Frauenhofer Institute, *op. cit.*

129 O. Povarov, V. Svalova, (n.d.) 'Geothermal Development in Russia: Country Update Report 2005–2009, 2010',

http://www.geothermal-energy.org/pdf/IGAstandard/WGC/2010/0145.pdf

O Povarov, A.Nikolski, G Tomarov (n.d.) 'Geothermal Resources for Local Heat and Power Supply in Russia',

http://www.geothermal-energy.org/pdf/IGAstandard/EGC/szeged/O-4-06.pdf

P. Bezrukikh *et al*, Reference book of resources of renewable energy sources in Russia and local types of fuel / indicators by territories, Moscow, IAC Energy, 2007 – 272 p. (in Russian).

130 Marek Strzelecki and Julia Mengewein (2014) 'Merkel's Green Push sinks German coal profits: energy', *Bloomberg*, 14 March, http://www.bloomberg.com/news/2014-03-14/merkel-s-green-push-blows-away-german-coal-power-profits-energy.html

131 Craig Morris and Martin Pehnt (2012) 'Energy Transition The German Energiewende', http://energytransition.de/wp-content/themes/boell/pdf/en/German-Energy-Transition_en_Key-Findings.pdf

132 *Ibid.*

133 Strzelecki and Mengewein, *op.cit.*

134 G. Parkinson (2014) 'Solar's Insane Cost Drop', *Clean Technica*, 16 April, http://cleantechnica.com/2014/04/16/solars-dramatic-cost-fall-may-herald-energy-price-deflation/

135 Frankfurt School-UNEP Centre (2014) 'Global Trends in Renewable Energy Investment 2014', http://fs-unep-centre.org/system/files/globaltrendsreport2014.pdf

136 A. Evans-Pritchard (2014) 'Global solar dominance in sight as science trumps fossil fuels', *The Telegraph*, 9 April, http://www.telegraph.co.uk/finance/comment/ambroseevans_pritchard/10755598/Global-solar-dominance-in-sight-as-science-trumps-fossil-fuels.html

137 Frankfurt School-UNEP Centre, *op. cit*.

138 Giles Parkinson (2014) 'Energy prices crash as Queensland solar takes hold', *Renew Economy*, 2 July, http://reneweconomy.com.au/2014/energy-prices-crash-as-queensland-solar-takes-hold-21256

139 Giles Parkinson (2014) 'Abbot modellers tip householders to invest $30bn in solar', *Renew Economy*, 25 June, http://reneweconomy.com.au/2014/abbott-modellers-tip-households-to-invest-30bn-in-solar-35627

140 Greenpeace (2012) 'Energy Revolution', http://www.greenpeace.org/international/en/publications/Campaign-reports/Climate-Reports/Energy-Revolution-2012/

141 Chris Martin, Mark Chediak and Ken Wells (2013) 'Why the U.S. Power Grid's Days Are Numbered', *Business* Week, 22

August,http://www.businessweek.com/articles/2013-08-22/homegrown-green-energy-is-making-power-utilities-irrelevant#r=hpf-s

Bloomberg (2013) 'Utility grid model sees tenuous future on solar Growth', 22 August, http://www.bloomberg.com/infographics/2013-08-22/utility-grid-model-sees-tenuous-future-on-solar-growth.html

142 International Renewable Energy Agency (2014) Renewable Energy and Jobs: Annual Review 2014', http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=415

143 D.M. Kammen, K. Japadia and M. Fripp (2004) 'Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?', RAEL Report, Berkeley: University of California, revised edition, http://rael.berkeley.edu/sites/default/files/very-old-site/renewables.jobs.2006.pdf

144 Union of Concerned Scientists (2013) 'Benefits of Renewable Energy Use', http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/public-benefits-of-renewable.html

145 See infographic at http://cleantechnica.com/2013/03/20/over-3-times-more-green-jobs-per-million-than-fossil-fuel-or-nuclear-jobs/

146 The Solar Foundation (2012) 'National Solar Jobs Census 2012', landing page, http://thesolarfoundation.org/research/national-solar-jobs-census-2012

147 J. Sandry (2013) 'Clean Energy is Creating Millions of Jobs – New Age of Energy Campaign', Mosaic Blog, https://joinmosaic.com/blog/clean-energy-creating-millions-jobs-new-age-energy-campaign/

148 IRENA (2014) 'Renewable Energy and Jobs, Annual Review 2014', http://www.irena.org/Publications/rejobs-annual-review-2014.pdf

149 *Ibid.*

150 Forbes (2013) 'Pipe Dreams: How Many Jobs Will Be Created By Keystone XL?', *Forbes*,10 May, http://www.forbes.com/sites/energysource/2013/05/10/pipe-dreams-how-many-jobs-will-be-created-by-keystone-xl/

151 Natural Resources Committee Democrats (2011) 'Profits and Pink Slips: How Big Oil and Gas Companies Are Not Creating U.S. Jobs or Paying Their Fair Share', landing page, http://democrats.naturalresources.house.gov/reports/profits-and-pink-slips-how-big-oil-and-gas-companies-are-not-creating-us-jobs-or-paying

152 Green Alliance, The Low Carbon Energy Lift: Powering Faster Development in Sub-Saharan Africa http://www.green-alliance.org.uk/lowcarbonenergylift.php

153 UNDP Sustainable Energy Video, http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/focus_areas/sustainable-energy.html

154 Green Alliance, op. cit. http://www.green-alliance.org.uk/lowcarbonenergylift.php

155 Greenpeace 'True Cost of Coal in South Africa: Paying the Price of Coal Addiction', http://www.greenpeace.org/africa/Global/africa/publications/coal/TrueCostOfCoal.pdf

156 IEA (2013) 'World Energy Outlook 2013', landing page, http://www.worldenergyoutlook.org/publications/weo-2013/

157 Stewart Craine, Evan Mills and Justin Guay (2014) 'Clean Energy Services for all: Financing Universal Electrification', 'http://action.sierraclub.org/site/DocServer/0747_Clean_Energy_Services_Report_03_web.pdf?docID=15922,

158 IRENA (2014) 'Peru Renewables Readiness Assessment 2014', p.XII, http://www.irena.org/DocumentDownloads/Publications/RRA_Peru.pdf

159 Rakteem Katakey and Debjit Chakraborty (2014) 'Modi to use solar to bring power to every home by 2019' *Bloomberg*, 19 May, http://www.bloomberg.com/news/2014-05-19/modi-to-use-solar-to-bring-power-to-every-home-by-2019.html

160 IDCOL (2014) 'Expression of Interest : Scaling up Renewable Energy Program under Climate Investment Funds', https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/Bangladesh_EOI.pdf

161 World Bank (2014) 'Bangladesh Receives $78.4 Million to Install an Additional 480,000 Solar Home Systems', World Bank, 30 June 2014, http://www.worldbank.org/en/news/press-release/2014/06/30/bangladesh-receives-usd-78-million-to-install-an-additional-480000-solar-home-systems

© Oxfam International October 2014

This paper was written by Hannah Stoddart, with Joseph Zacune and Lydia Prieg. Oxfam acknowledges the assistance of Kiri Hanks, Andrey Rakhmanov, and Sasanka Thilakisiri in its production. It is part of a series of papers written to inform public debate on development and humanitarian policy issues.

For further information on the issues raised in this paper please e-mail advocacy@oxfaminternational.org

This publication is copyright but the text may be used free of charge for the purposes of advocacy, campaigning, education, and research, provided that the source is acknowledged in full. The copyright holder requests that all such use be registered with them for impact assessment purposes. For copying in any other circumstances, or for re-use in other publications, or for translation or adaptation, permission must be secured and a fee may be charged. E-mail policyandpractice@oxfam.org.uk.

The information in this publication is correct at the time of going to press.

Published by Oxfam GB for Oxfam International under ISBN 978-1-78077-739-9 in October 2014.
Oxfam GB, Oxfam House, John Smith Drive, Cowley, Oxford, OX4 2JY, UK.

OXFAM

Oxfam is an international confederation of 17 organizations networked together in more than 90 countries, as part of a global movement for change, to build a future free from the injustice of poverty:
Oxfam America (www.oxfamamerica.org)
Oxfam Australia (www.oxfam.org.au)
Oxfam-in-Belgium (www.oxfamsol.be)
Oxfam Canada (www.oxfam.ca)
Oxfam France (www.oxfamfrance.org)
Oxfam Germany (www.oxfam.de)
Oxfam GB (www.oxfam.org.uk)
Oxfam Hong Kong (www.oxfam.org.hk)
Oxfam India (www.oxfamindia.org)
Oxfam Intermón (Spain) (www.oxfamintermon.org)
Oxfam Ireland (www.oxfamireland.org)
Oxfam Italy (www.oxfamitalia.org)
Oxfam Japan (www.oxfam.jp)
Oxfam Mexico (www.oxfammexico.org)
Oxfam New Zealand (www.oxfam.org.nz)
Oxfam Novib (Netherlands) (www.oxfamnovib.nl)
Oxfam Québec (www.oxfam.qc.ca)

Please write to any of the agencies for further information, or visit www.oxfam.org.