CAPITAN AMERICA

US climate goals: a reckoning

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EMISSIONS
REDUCTION
GOAL

Foreword

After nearly three decades of climate change denial, the US has decided enough is enough. Climate change is real, and the US must act. It has submitted its Intended Nationally Determined Contribution — its emissions reduction framework — to the climate treaty secretariat. It has set out its climate change action plan. Dramatic. The Paris climate conference is the stage for an operatic unfolding. The world is already celebrating — the prodigal has returned.

We present a few inconvenient truths — one per chapter — that might throw cold water on the celebration. The US climate action plan is dramatic. But it is neither ambitious nor equitable. Worse, it is but business-as-usual. If implemented, we have analysed, emissions reduction will be marginal. Whatever reduction is achieved, whether due to increased efficiency or a shift in fossil fuel use, will be run over by runaway gluttonous consumption. We conclude, for the sake of the world's future: American lifestyle can no longer remain not-negotiable.

Will our stance lead to huge disquiet? Our friends in US civil society are sure to accuse us of playing into the hands of the Republican Party — that fearsome free-market gang of raucous climate sceptics. Here is a president, they will say, who has finally come out of the closet. It has taken President Barack Obama courage to act on what he declaimed in the first year of his eight-year presidency, when he spoke loudly and with passion about the coming climate catastrophe. We, they will rue, are discounting this effort. Discrediting US policy drift. We are providing serious grist, they will scold, to the anti-climate change mill in the country. Our position on the need to discuss consumption in climate change will fuel their worst fears: the world wants to close their free-market frontier.

We would have agreed with them, except for the following issues.

One: the US really believes, its action plan is perhaps the beginning of real change; even if the plan isn't ambitious, once accepted the momentum might allow it to pick up speed and scale. Unfortunately, our analysis shows that is

not the case. So, the world cannot keep deluding itself that the climate action eagle has landed.

Two: more seriously, the dangers of climate change are real and the need for real action urgent. We in India are beginning to see how devastating extreme weather events can be — they are death-dealers; in India, they are taking lives. The world's poorest, who have not contributed to the emissions already in the atmosphere, are becoming the most affected. This is not acceptable. Climate justice requires effective and ambitious action to cut greenhouse gases. Nothing else is acceptable.

Three: for many years now, we have been told, by our same friends in the US civil society, that we must always fear the return of the Republicans, for they will destroy even the vestige of US climate change policy. And when a Democrat president is elected, the advice is we need to 'tone down', be pragmatic and allow that 'liberal' person to steer the climate course. Actually, for many years, their Game of Thrones has held us to ransom. Decades have gone, and deadly greenhouse gas emissions still continue to rise.

We have nothing against such advice. All would have been all right if the Democrat government in the US had, for the first time, taken hard and decisive steps to reduce emissions, starting today and more tomorrow. But, as our assessment shows, this is not the case.

So, it is time we stopped tiptoeing around the US. It is time to call a spade a spade: US obduracy on climate change has ensured the world today is in the danger zone and will go critical soon. Since 1992, when the framework convention on climate change was signed, the US has played offense — finger-pointing at others and justifying its own lack of action. It is time the rest of us stopped playing defense. For the Planet's sake.

We do take heart from the words of President Obama, who said as plainly as possible, in Alaska in August, that the threat of climate change is real, and he fears not enough is being done to combat it. "We are not acting fast enough," he repeated over and over again. This is true. This is what the American people need to be told.

They cannot be fed the story, repeated by their leaders and the powerful media of the free world, that it is the emissions of China and India that are frying the

world. The American people cannot be told that they needn't act, because other countries — opting for the right to development — refuse to make a move. The 'right to development' of the poor, who need carbon space and ecological space for their growth, cannot be equated with the 'right to pollute' of the rich. The burden of transition cannot be shifted because the rich of the world are rich and so powerful.

At this juncture, we cannot afford to be inconsiderate. Raising the issue of America's lack of action, we really fear, might justify similar renegade steps from countries like India. Everbody will use the US as a cloak. Argue: first the US, then us. This is not our intention. As environmentalists, we are pushing our government to take aggressive steps to reduce emissions, not only because it is in the interest of the world, but also because it is in our interest to do what we can to re-invent growth without pollution.

In this case, our conviction also comes from the fact that in India the tide of climate-denial has turned. We are enjoined in the pain of our farmers, who, for the last three years, have lost everything because of freak hail and weirdly-timed rain. A single event cannot be attributed to climate change, but the frequency of these weather anomalies is making us think deep. And weep.

Our concern is different. US lifestyle and consumption patterns are aspirational and addictive. Quite simply, everybody wants to be an American. Every citizen of the developing world wants to either live in America or live like an American. If it were possible to attain such a lifestyle and yet combat climate change, our concern would be unfounded. But we all know that is not possible. We also know that if Americans continue their guzzle, it is not possible to expect the rest will not follow in their footsteps. The world — the US and us — cannot combat climate change without changing the way we drive, build homes or consume goods. The C-word is the C-word.

Climate change demands we collaborate and act collectively. The US is the world's most powerful economy, a world-leader. This leader has to take the lead, point to the direction of change that must be credible and meaningful. Otherwise, the deal will not fructify. We all lose.

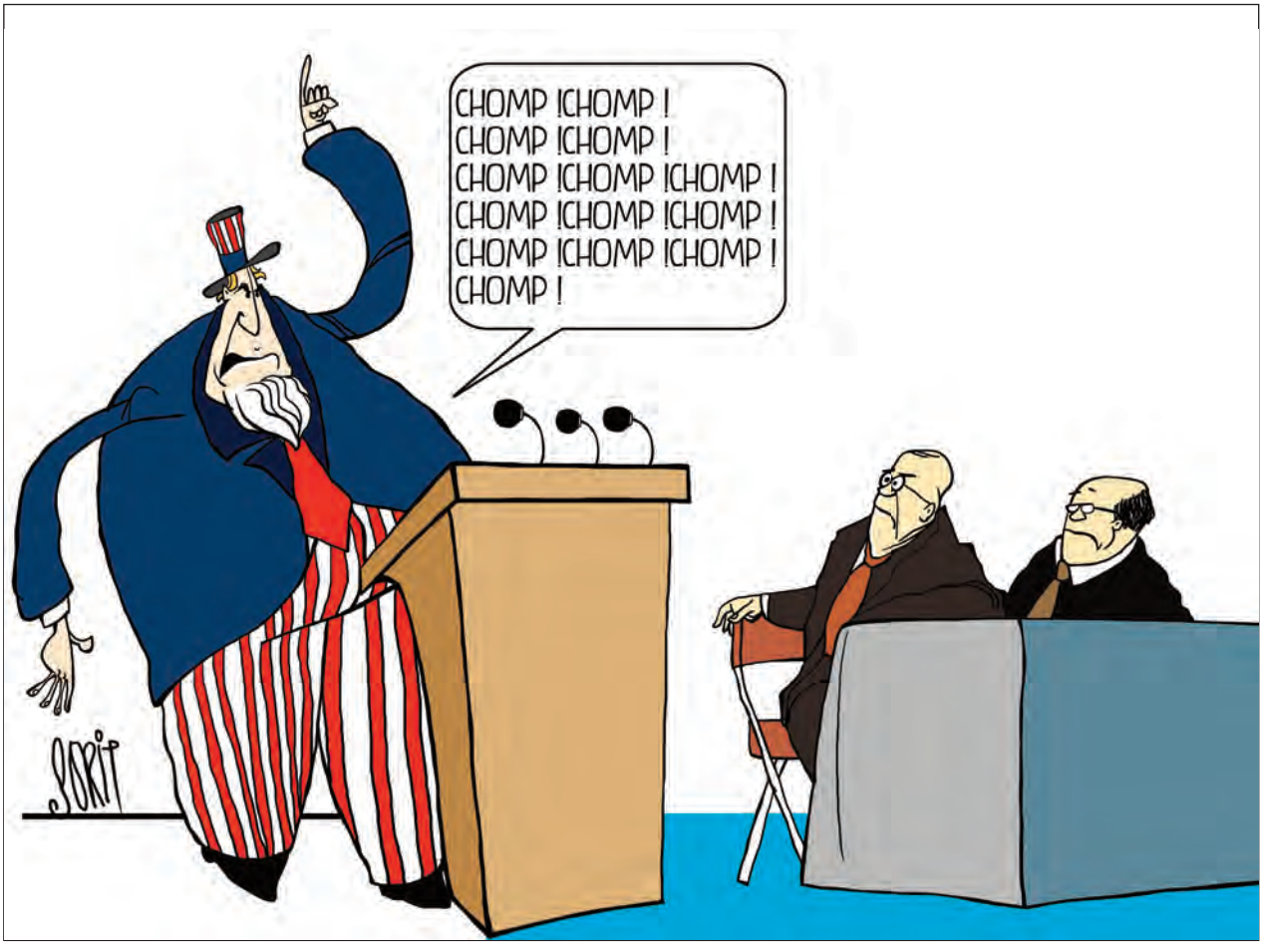
The US is also a leader because of the strength of its institutions, such as the Environmental Protection Agency or the Energy Information Administration. Remarkable data. Remarkable analysis. We wish we had the

same resources. But, amazingly, nobody seems interested in putting this data out, or using it.

Here is cause for a niggling worry. We have found an enormous restraint — even a tendency towards self-censorship — in big and powerful US civil society groups. These largely Washington-based organisations do not want to push the envelope very much. They are satisfied — perhaps due to the nature of the power equations in their country — to be meek in their critique or in the solutions they advocate. For instance, these groups are asking — rightly — for car restraints in many parts of the developing world. But in the US, they still push fuel economy standards and, at most, hybrid cars as the panacea to climate ills. There is no bus rapid transit being built in the US, where over 70-80 per cent people commute to work in cars. This is where practice must also happen, so that the world can follow and emissions reduce. Change has to be real. Change has to be measurable and meaningful.

What a win-win opportunity. If the US can change its ways — harness its enormous ingenuity and innovation to re-invent the lifestyles of the rich and famous so that they can be emulated by all, without blowing up the Planet — we are home and dry. We hope the US will.

Sunita Narain
Chandra Bhushan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- **The perception is that after peaking in 2005, US total greenhouse gas emissions have been reducing. Not true.**

- **Compared to 1990 levels, greenhouse gas emissions are up 6 per cent.**

- **1990-2013, carbon dioxide emissions are up 7.4 per cent. Carbon-dioxide emissions comprise 82 per cent of all US greenhouse gas emissions.**

- **In the INDC the US has submitted to the climate secretariat, it will reduce greenhouse gas emissions 26-28 per cent below 2005 levels by 2025. Just by using 2005 as its baseline year, the US has avoided cutting 500 million metric tonnes of greenhouse gas emissions.**

- **On a 1990 baseline the US will reduce emissions by a mere 13-15 per cent by 2025. This is even lower than what it had pledged in 2010 in the Cancun climate meet.**

- **In percentage as well as absolute terms, the INDC of the US is far less ambitious than that of the EU-28.**

- **In its INDC, the US has said it will depend on land use, land use changes and forestry (LULUCF) to reduce emissions. By so doing, it has avoided cutting 250 million metric tonnes of greenhouse gas emissions by 2025.**

1. Misprison?

US climate-action stance seems proactive. Seems

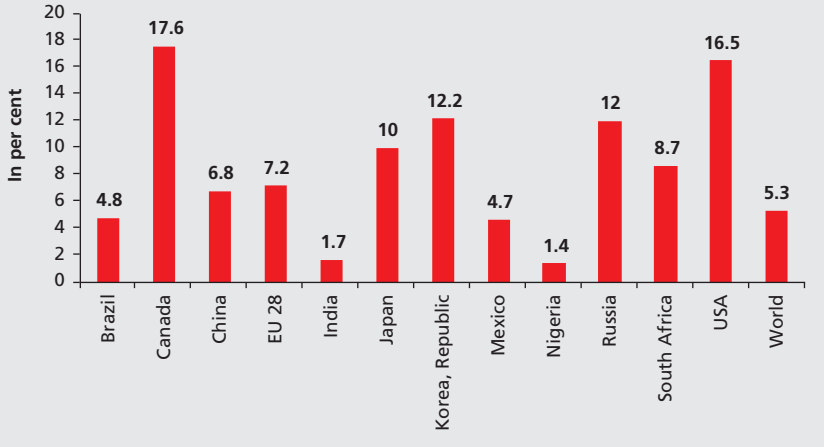
Till 2006, there was only one narrative in town: the United States, with five per cent of the world's population, was the world's biggest emitter of greenhouse gases (GHGs), and whereas the world agreed action was urgently needed to drastically reduce GHG emissions, especially CO_2 emssions, the US differed. It was like a climate-action caterpillar, doggedly munching away a leaf on its own, postponing its transformation to the chrysalis stage.

In 2006, China overtook the US as the single largest GHG emitter. Now the narrative changed. Suddenly all attention turned to China, its spewing chimneys and growing middle-class. The shift literally occurred overnight. In Western media reportage, the matter of US emissions became a there's-no-breaking-news-in-this-one story. In Western, especially US, thinktank deliberation, the matter became a now-see-who's-painting-the-town-red? plot. Since China was now the largest contributor, went the new plot, the onus of mitigating climate change was no longer with the US. It primarily lay with China. India's growing emissions, too, became a watch-this-strand sub-plot — perhaps the new plot needed spicing up.

Of course China's annual emissions today are higher than that of the US. But such a bald assertion glosses over irrefutable, indeed inconvenient truths. One, the US remains the no 1 historical GHG emitter, especially CO_2 (see Section: *What of the Stock?*). Two, its per capita CO_2

Graph 1.1: Per capita emissions, 2012

The US per capita emissions are flagrantly high



Source: Anon 2014, Global Carbon Budget Factsheet, Centre for Science and Environment

6%

Increase in US emissions, 1990-2013

8.8%

Growth in emissions from fossil fuel combustion, responsible for most of the hike in national emissions

US INDC: a glance

A 'promises to keep' kind of poetic procedural submission

In May 2015, the US submitted its Intended Nationally Determined Contribution, or INDC, to the secretariat of the UN climate convention. The INDC states that the US intends to achieve an economy-wide GHG reduction target of 26-28 per cent below what it emitted in 2005 by 2025. It will make best efforts to reduce emissions by 28 per cent.

The INDC goes on to say that "the target is fair and ambitious".

It justifies: "The United States has already undertaken substantial policy action to reduce its emissions, taking the necessary steps to place us on a path to achieve the 2020 target of reducing emissions in the range of 17 per cent below the 2005 level in 2020. Additional action to achieve the 2025 target represents a substantial acceleration of the current pace of greenhouse gas emission reductions. Achieving the 2025 target will require a further emission reduction of 9-11 per cent beyond our 2020 target compared to the 2005 baseline and a substantial acceleration of the 2005-2020 annual pace of reduction, to 2.3-2.8 per cent per year, or an approximate doubling".[1] Let's look at the target itself.

Under the 2010 Cancun agreement, the US had put on the table the following roadmap for emissions reduction: 17 per cent below 2005 level, by 2020; 30 per cent by 2025 and 42 per cent by 2030. Now, its INDC only talks about reducing by 26-28 per cent by 2025, which is even lower than the weak Cancun pledge.[2]

Moreover, a simple comparison with the INDC of other developed countries, such as the EU-28, shows how weak the 2015 roadmap is. The Centre for Science and Environment has linearly extrapolated the US intended effort and found the following:[3]

- The US will reduce its total greenhouse gas (GHG) emissions by 34-37 per cent below 2005 levels by 2030. But on a 1990 baseline, the US will cut emissions by a mere 13-15 per cent by 2025 and 23-27 per cent by 2030. Compare with EU-28, which has committed to reduce 40 per cent below its 1990 emissions levels by 2030.
- Vis-a-vis 1990, the US will cut annual emissions by 1,400-1,650 million metric tonnes CO_2 equivalent ($MMTCO_2e$) by 2030. In comparison, the EU-28 will reduce their annual emissions by 2,250 $MMTCO_2e$ by 2030 from its 1990 levels. So, both in percentage and absolute emissions reduction terms, the EU-28's ambitions are far higher than the US.
- In 2030, total GHG emissions in the US will be 4,500-4,700 MTCO2e. Per capita emissions will be 12.5-13 tonnes. By contrast, in 2030, EU-28 total emissions will be 3,365 $MTCO_2e$. Per capita emissions? 6.5 tonnes.

Crucially, the INDC uses a baseline convenient only to the US. Now, it can conveniently reduce against this single year. Whatever happened to the fact that, 1990-2005, the US actually increased its share of global emissions, and at a time it was expected to reduce? Absolute camouflage. It is an erasure that weakens another important plank of the US's future intentions: its statement in the cover note that the INDC is 'fair'.

To move on. The INDC specifically mentions that it will include sinks — reductions from forestry and the land use sectors — to achieve its already unambitious target. This is problematic, given the weaknesses in methodology in accounting for sinks and the fact that such a reliance on sinks provides cover to the growth of emissions.

emissions (the most important GHG) are among the highest in the world (see Graph 1.1: *Per Capita GHG Emissions, 2011*). Three, its dogged lack of ambition in contributing to climate change mitigation has always been a puzzle and a persistent migraine, for the US has always been the Richie Rich of nations, always had all the capacity needed to reduce its GHG emissions. It is still rich and eminently capable (see Infographic: *A Godly Capacity*). Is it still as unambitious?

No, ostensibly. The US claims it has put in place robust climate-action policies that are already showing results. The Western media and thinktanks, especially US thinktanks, largely support the claim. It seems the reluctant caterpillar has turned chrysalis. Not only that: the newest twist in the new plot is that the US has actually emerged from the chrysalis of self-conscious climate inaction. This butterfly is all a-flutter and is an unbesmirched specimen.

All a-flutter

US climate-action claims today wing on a twister of nationally-relevant plans as well as procedurally-relevant international submission.

On June 25, 2013 US President Barack Obama announced his Clean Action Plan. The plan outlined 75 goals in three areas: cutting CO_2 pollution in the US, preparing it for climate change impacts, and leading international efforts to address climate change.[1]

The US has also published '2014 CAR: United States Climate Action Report 2014'. Two documents comprise this US Department of State publication: the 'First Biennial Report of the United States of America' and the 'Sixth National Communication Under the United Nations framework Convention on Climate Change'. In his 'message' in '2014 CAR', US Secretary of State John F Kerry summarised what the US, under President Obama's leadership, had done to reduce emissions:

- Doubled wind and solar electricity generation;
- Adopted the toughest fuel economy standards in US history for passenger vehicles;
- Advanced environmental standards to expedite the transition to cleaner and more efficient fuels in power plants; and
- Increased the energy efficiency of homes, industries and businesses.

This, Kerry said, was showing results, "as since 2005 our emissions have fallen by 6.5 per cent, even as our economy continues to grow." He added: "This is an important signal to the world that America is ready to act."[2]

On August 3, 2015 President Obama launched the Clean Power Plan, to reduce emissions from power plants (see Chapter 4: *Light Years Away*). In the same month, the US Environmental Protection Agency (EPA) issued rules to substantially cut methane emissions from the oil and gas industry (see Chapter 7: *Industry*).

Internationally, the US submitted to the global climate treaty secretariat — as per procedure — its Intended Nationally Determined

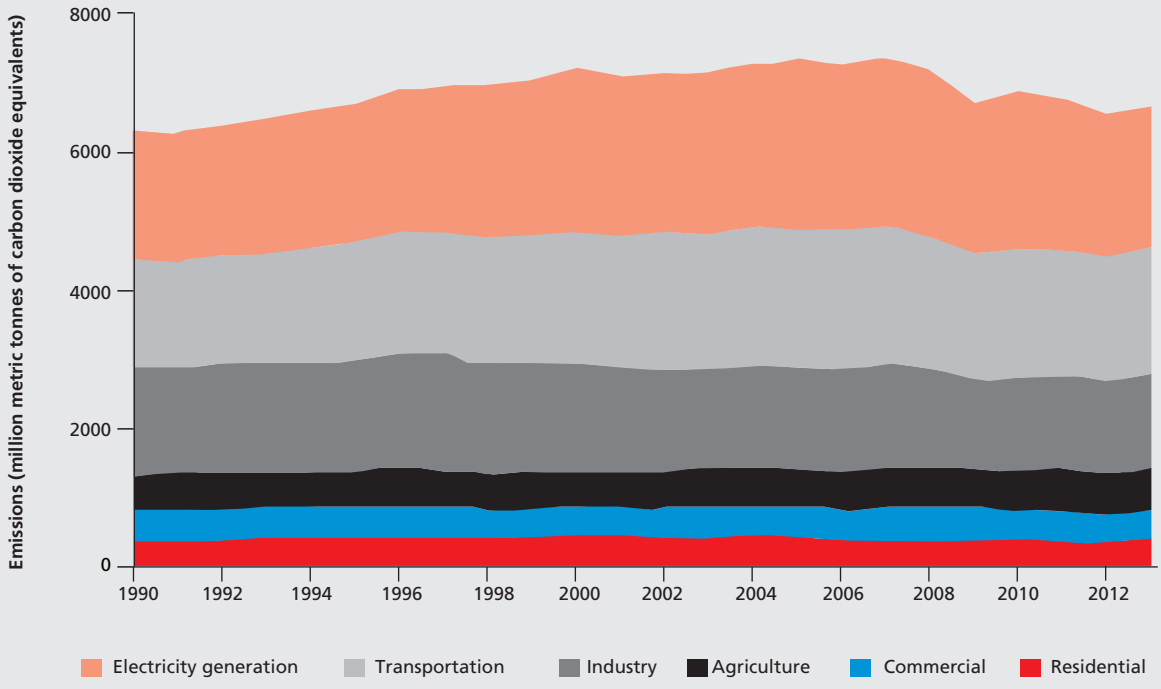
12.5-13

In tonnes, US per capita emissions in 2030, as per extrapolation of its INDC

6.5

In tonnes, EU-28 per capita emissions in 2030, as per extrapolation of its INDC

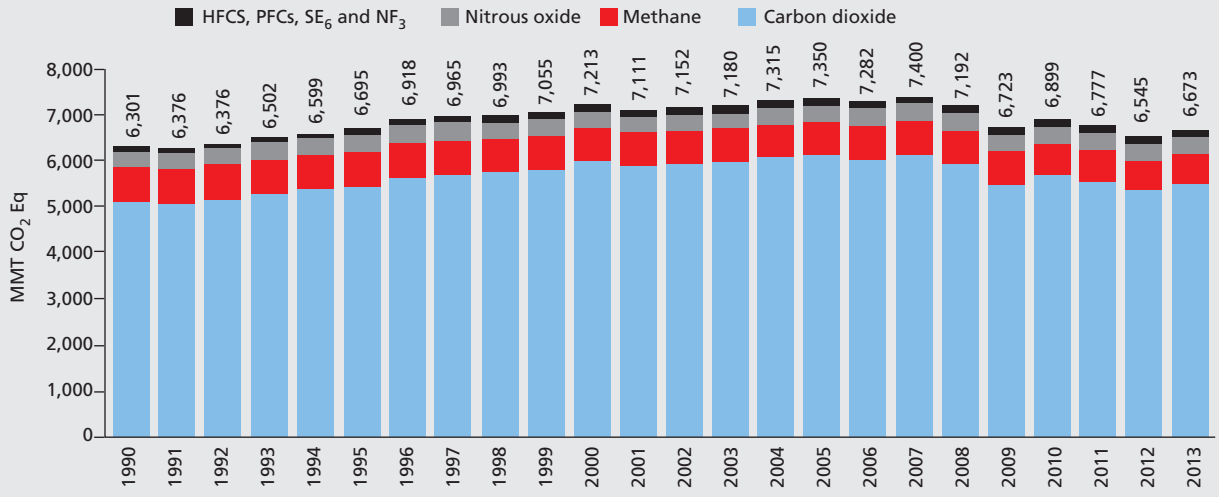
Graph 1.2: Greenhouse gas emissions by economic sector, 1990-2013



Percentage change in emissions: 1990-2013

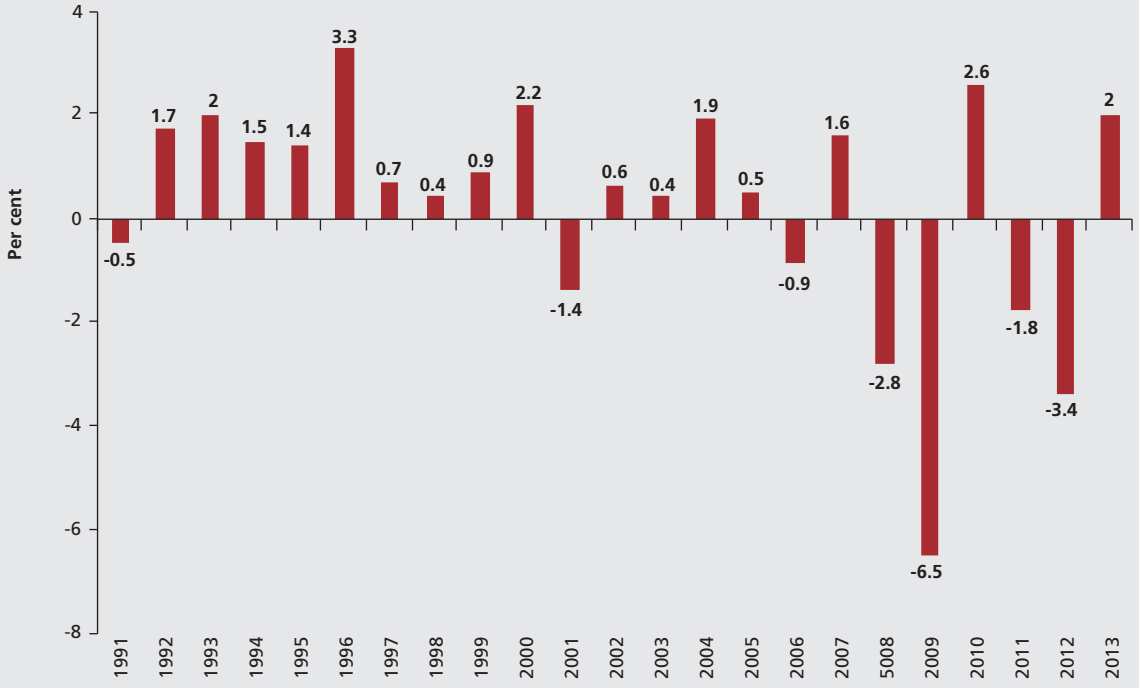
↑ 11.4% Electricity	↑ 16.4% Transportation	↓ 12.3% Industries
↑ 19.1% Agriculture	↓ 5.6% Commercial	↑ 8.3% Residential
↑ 5.9% Total Emissions	↑ 13.7% Sinks	↑ 4.8% Net Emissions (subtracting sinks)

Graph 1.3: Greenhouse gas emissions, by gas, 1990-2013



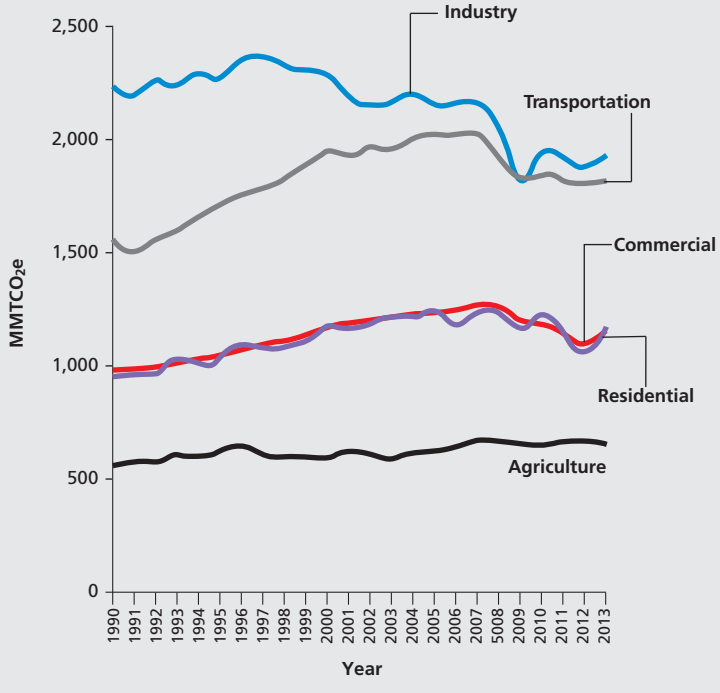
Source: Anon, 2015 'Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013' U.S. Environmental Protection Agency, 76

Graph 1.4: Fluctuation in emissions



Source: Anon, 2015 'Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013' U.S. Environmental Protection Agency, p 77

Graph 1.5: Sectoral emissions, including emissions from electricity use



Source: Anon, 2015 'Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013' U.S. Environmental Protection Agency, p 48

Greenhouse gas emissions in the US remain very high, across the key sectors that comprise the US economy.

The overall trend, 1990-2014, in greenhouse gas emissions is fluctuating, not downward.

Carbon dioxide is the dominant greenhouse gas the US emits.

These facts fly against claims by the US that, since peaking in 2005, emissions are down.

It is mere year-to-year fluctuation, that occurs for various reasons: general economic conditions, energy prices and weather.

Contribution, further proof it was in ready-to-act mode (see Box: *US INDC: a glance*).

In short, the butterfly — climate-action Psyche embodied by President Obama — has fully taken wing.

The US is using existing regulatory instruments to do all it can to bend its emissions curve. It is not business-as-usual anymore in the US. Its butterfly-as-usual. Is this really so, we ask. Is the butterfly a masquerade? An utterly non-butterfly effect?

We ask : what do you mask?

What *are* the GHG emissions of the US, especially CO_2? What *is* the contribution of this country, with 5 per cent of the world's population, to the gases already in the global atmosphere? Has this contribution been reducing since 2005, when its emissions peaked (a fact the US has made the most of, using 2005 as its baseline year for emissions reduction, as against 1990, the globally preferred emissions reduction baseline the climate convention has stamped its approval on)?

2009-2011, points out 2014 CAR, average US GHG emissions fell to the lowest level for any three-year period since 1994-1996[3], fuelling the impression the US does have policies that will lead to long-term changes and result in emissions reduction each year.

Wrong.

6,673

In million metric tonnes of carbon dioxide equivalent, US greenhouse gas emissions, 2013

Emissions flow

Total GHG emissions in the US did peak in 2005, to over 7,350 million metric tonnes of CO_2 equivalent (MMT CO_2e). Subsequently, emissions reduced 2009-2012. But 2012-2013, emissions increased by 2 per cent, or about 128 MMT CO_2e, according to data the US Environmental Protection Agency (EPA) has published.[4] In the same period, CO_2 emissions — by far the predominant global-warming gas emitted — saw a spike: up by close to 3 per cent.[5]

But it is still not clear the US has actually begun reducing its emissions. Only consider the emissions inventory the US EPA has published.

What is the overall trend? In 2013, total US GHG emissions were 6,673 MMT of CO_2e[6], including 5,502 MMT of CO_2 emissions.[7] Overall, compared to 1990 levels, total GHG emissions are actually up, by 6 per cent.[8] And 1990-2013, CO_2 emissions increased by 381.5 MMT CO_2, up 7.4 per cent.[9] In other words, the overall trend is that US GHG emissions, especially CO_2, are higher than in 1990 (see Graph 1.2 and 1.3: *Greenhouse gas emissions, 1990-2013*). Up and up.

What about the 2009-2012 dip, then? The 2012-2013 spike?

These are mini-trends, that mask the overall trend. Although the EPA calls these 'trends', its explanation gives the game away. These trends, the EPA explains, "can be attributed to multiple factors including increased emissions from electricity generation, an increase in miles

travelled by on-road vehicles, an increase in industrial production and emissions in multiple sectors, and year-to-year changes in the prevailing weather."[10]

In fact, the mini-trends are a mere time-to-time fluctuation. No way can they be mistaken for a general propensity, downwards, in GHG emissions, especially CO_2 (see Graph 1.4: *Fluctuation in emissions*). The EPA points out that annual variation is a response to changes in general economic conditions, energy prices, weather and to what extent non-fossil alternatives exist. For instance, "a year with increased consumption of goods and services, low fuel prices, severe summer and winter weather conditions, nuclear plant closures and lower precipitation feeding hydroelectric dams would increase fossil fuel consumption than a year with poor economic performance, high fuel prices, mild temperatures and increased output from nuclear and hydroelectric plants".[11]

Overall, EPA's analysis provides a picture athwart US climate-action claims. Historically, the dominant factor in US emissions trends has been emissions from combusting fossil fuels. Between 1990 and 2013, CO_2 emissions from fossil fuel combustion increased from 4,740.7 MMT CO_2e to 5,157.7 MMT CO_2e, an 8.8 per cent increase, affecting most of the increase in national emissions.[12] There's another concern. CO_2 emissions comprise 82 per cent of all US emissions.[13] And GHG emissions from the key sectors—electricity, transport, the residential and commercial sector —show no decrease at all. Industrial sector apart (see Chapter 6), just a year-to-year variation (see Graphic: *Percentage change in emission, 1990-2013* and Graph 1.5: *Sectoral emissions, by electricity end user*).

5,502

In million metric tonnes, US carbon dioxide emissions, 2013

Mask 1: the 2005 'peak'

It is pertinent to go to the snub of all climate-action things: the 2005 'peak' in US emissions.

Well, the 'peak' has attained mythological status in the global perceptual understanding of US climate-tackling commitment. The US has picked, pickled and endlessly packaged it. Here is a roadshow the US has taken round the world. It is a smash hit. So far.

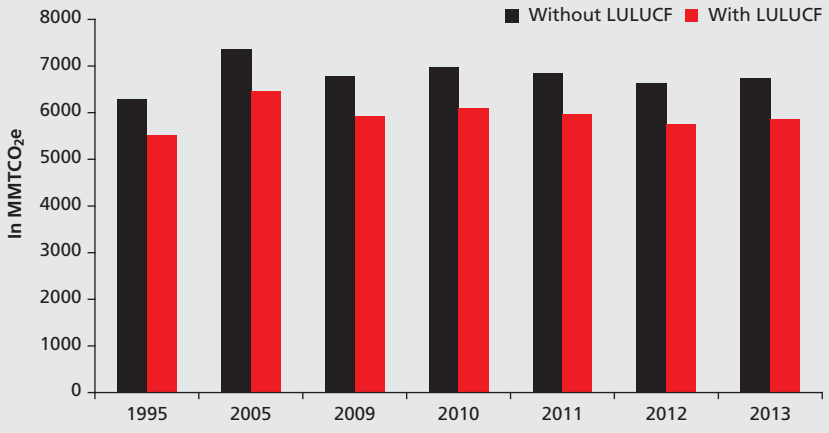
Whereas 1990 is the baseline fixed in the global climate convention for nations to reduce GHG emissions, the US' choice is 2005. It is the first mask the US wears to veil its climate-inaction. The US has cleverly used 2005 as its base year because, 1990-2005, the US allowed its emissions to grow, whereas it should have actually been reducing its emissions.

The masking effect of 2005 as a base to reduce emissions translates to millions of tonnes of CO_2 emissions the US has cloaked — that, for some reason, the world has failed to notice.

In its INDC submitted in May 2015, the US has agreed to reduce GHG emissions 26-28 per cent below 2005 levels by 2025. This means the US has agreed to cut GHG emissions to 4,700-4,800 MMTCO_2e by 2025, compared to 6,438 MMTCO_2e in 2005. If the US had used 1990 as base year

Graph 1.6: 14 per cent of what the US emits is sequestered

But sinks often hide the true extent of emissons



Source: Graph generated by the Centre for Science and Envieonment using the greenhouse gas inventory dataset provided by the US Environmental Protection Agency

250

In million metric tonnes carbon dioxide equivalent, emissions the US will avoid cutting, by 2025, by relying on sinks

and gone for the same degree of emissions reduction as it has in the INDC, in 2025 its total emissions would have been 4,200-4100 $MMTCO_2e$. Just by changing the base year, the US has avoided cutting 500 $MMTCO_2e$ of GHG emissions by 2025.[14]

Mask 2: Sinks

Countries often create their emissions profile by using a metric called 'net emissions'; they assume some of the pollution they create gets absorbed, or cleaned up, by terrestrial sinks, mainly forests and grasslands.

In 2013, the US' net emissions were 5.8 billion tonnes CO_2e. In its case, the scale and size of removal by sinks is not small. For, says the EPA, terrestrial sinks sequester some 0.88 billion tonnes CO_2e of GHGs — roughly, 14 per cent of what the US emits in toto (see Graph 1.6: *14 per cent of what the US emits is sequestered*).[15]

(To get an idea of the scale, compare it to India's annual GHG emissions, which in 2013 were roughly 2.5 billion tonnes CO_2e.[16] In other words, US sinks remove roughly one-third of what India, with its huge population, emits today).

How accurate are these measurements? Who has audited or verified these numbers? The EPA has done a formidable job in putting together these estimates using a method the climate convention has established. At the same time, it is well known that calculation of sinks — what forests of different ages and types, in different regions, actually sequester — is still a nascent science.

The question of real-time calculation is important. Because the US has not only increased its emissions between 1990 and 2013, its net flux

— GHG emissions US sinks have removed — is also up. In 1990, all sinks accounted for 0.762 billion tonnes CO_2e of GHG removal. By 2013, sinks became more efficient or proactive, removing 0.858 billion tonnes CO_2e of GHGs[17]. In the US sinks inventory the EPA has published, the primary reason given is improved forest carbon stock.[18]

The fact is that land use, land use change and forestry (LULUCF) is another mask that allows the US to conceal more emissions.

In 2005, US GHG emissions with LULUCF were 6,438 $MMTCO_2$e. Excluding LULUCF, total GHG emissions were 7,350 $MMTCO_2$e. So, the US actually emitted 7,350 $MMTCO_2$e of GHGs from various sources, but by including carbon sinks of about 900 $MMTCO_2$e in forests and on land in its ledger, it has reduced its GHG emissions to 6,438 $MMTCO_2$e.

Further, in its INDC the US has said that LULUCF is a certain plank in its GHG emissions reduction plans. If US had agreed to reduce its emissions by excluding LULUCF, it would have had to cut 250 $MMTCO_2$e more GHGs in 2025. By including LULUCF, it has avoided cutting a huge amount of emissions.

What of the Stock?

So far, we have looked at the 'flow' of US emissions. But what of the stock: 411 billion tonnes CO_2, emitted 1850-2011?[19] The US has borrowed from the global commons a share of other countries' carbon space to become the economic powerhouse it is today. This is its natural debt. And, as with a financial debt, the natural debt needs to be paid. Try as it might, the US cannot erase its historical emissions from its climate action record. CO_2 is a gas with a past, present and future. Once emitted, it stays in the atmosphere. So, the US's past emissions are a legacy that must be accounted for in any future emissions reduction plan or move.

411

In billion tonnes, the amount of carbon dioxide the US has emitted, 1850-2011

1850-2011, the US was responsible for 21 per cent of CO_2 emissions in the atmosphere.[20] These emissions have caused the warming we see today, whose impacts are now devastating the lives of the poorest. It has the capacity. But it also has the responsibility to reduce emissions (see Infographic: *A Godly Capacity*). Not by tinkering year-to-year, or creating a perceptual veneer of reduction, but rather through drastic reductions that make space for the rest of the world to grow.

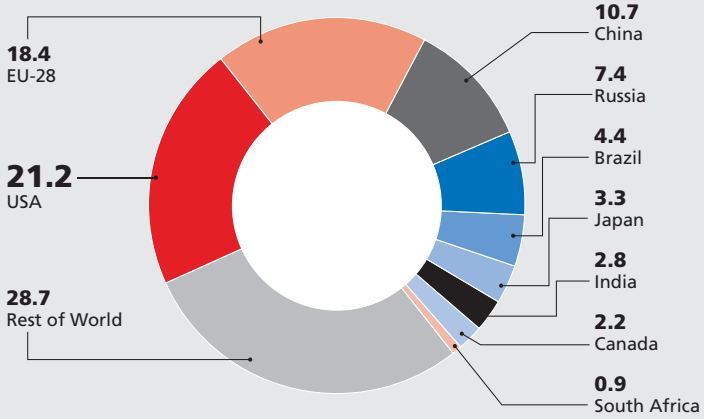
Its historical contribution is huge. Its current emissions are high. Moreover, by a) choosing 2005 as base year and b) including LULUCF in its future GHG emissions reduction plans, the US has masked 750 $MMTCO_2$e of excess GHG emissions in 2025.[21]The US really needs to walk the talk. Can it? Read on.

A Godly Capacity

The US is prosperous enough to take on ambitious climate targets

- Historically, the US has been the biggest emitter of greenhouse gases. Its responsibility in forcing climate change has been the most
- Currently, the US is the 2nd largest emitter of greenhouse gases
- It is important for the US to overcome its state of climate perdition
- The good news is that the US can. It has such immense capacity
- Every parameter of well-being points to the fact that the US can take on a very ambitious target to reduce emissions of greenhouse gases, especially carbon dioxide

Percentage of global CO_2 emissions: Past and present (1850-2011)



	USA	EU-28	India	China
Total historical emissions (1850-2011) in million tonne CO_2	3,61,299.98	3,25,545.08	35,581.29	1,40,860.33
Per capita CO_2 emissions (metric tonne, 2012)	16.5	7.2	1.7	6.8
GDP (PPP, 000' US $, 2011)	1,55,33,800	1,68,11,791	59,62,978	1,34,95,910
GDP per capita (US $, 2011)	49,854	33,414	4,883	10,041
Total primary energy consumption (Quadrillion BTU, 2011)	97.46	72.67	23.47	103.72
Total renewable electricity net consumption (billion KWh, 2011)	527.5	684.8	160.4	801
Per capita electricity consumption (KWh)	13,246	5,738	684	3,298
Motor vehicles per thousand (in 2011)	786	473	18	69
Air travel (million passenger trips in 2013)	743	NA	75	352
Human Development Index (2013)	0.914	0.735	0.586	0.719

Sources: World Bank, IEA, HDI report


WHAT YETI ?
IT'S YOUR
CARBON
FOOTPRINT !
Yeti
SORIT

- **The US energy system is too fossil-fuel reliant. Today, coal, natural gas and oil motor 80 per cent of all US energy needs.**

- **The US is the world's top producer of petroleum and natural gas. 1990-2014, fossil fuel production in the US is up 18.3 per cent.**

- **US per capita coal consumption is marginally higher than China's and 5 times higher than India's.**

- **Natural gas consumption is at a historic high. 1990-2014, up 40 per cent.**

- **1990-2014, US consumption of oil rose 8 per cent.**

- **An American consumes twice as much energy as a European, 4 times more than a Chinese and 16 times more than an Indian.**

- **1990-2014, US per capita energy consumption has annually reduced by an insignificant 0.4 per cent.**

2. The Guzzle Puzzle

Seems an entrenched fossil fuel user is changing tack. Seems.

In his introduction to the *First Biennial Report of the United States of America*, Secretary of State John Kerry claimed the US was taking strong action on climate change: "...we are closer than we've ever been to a breakthrough".[1]

Let's take him for his word. Perhaps the US is changing its ways.

The US has always been a fossil fuel-dominant economy (see Graph 2.1: *Share of energy consumption in the US: 1776-2014*). Three fossil fuels — petroleum, natural gas, and coal — have always ruled the source-of-energy roost (see Graph 2.2: *Energy consumption in the US, 1776-2014*). Even now, they constitute the absolute basis for energy production: at least 80 per cent of all the energy the US needs is from these fossil fuels.

Overall, the scenario isn't changing. Guzzle-wise, the US is today the world's top producer of petroleum and natural gas. It now produces more crude oil than Saudi Arabia and more natural gas than Russia (see Graph 2.3: *World's top producer of petroleum and natural gas*). Since 1990, even as the world began taking climate change seriously, fossil fuel production in the US has only increased: 1990-2014, up 18.3 per cent (see Graph 2.4: *Fossil fuel production*). Fossil fuel consumption in the US, too, has risen: 1990-2014, by 11 per cent (see Graph 2.5: *Fossil fuel consumption*). Kerry's claim is becoming a bit of a puzzle. Let's further unpack the scenario.

Coal: is the King dead?

The urgency to move away from coal has taken on an evangelist dimension, with President Barack Obama urging the world to "keep the king of fuel in the ground".[2] Recently, he described a US Environment Protection Agency (EPA) step to control coal-burning as "the biggest, most important step we've ever taken to combat climate change".[3] He added, "Power plants are the single biggest source of the harmful carbon pollution that contributes to climate change. Think about that".[4]

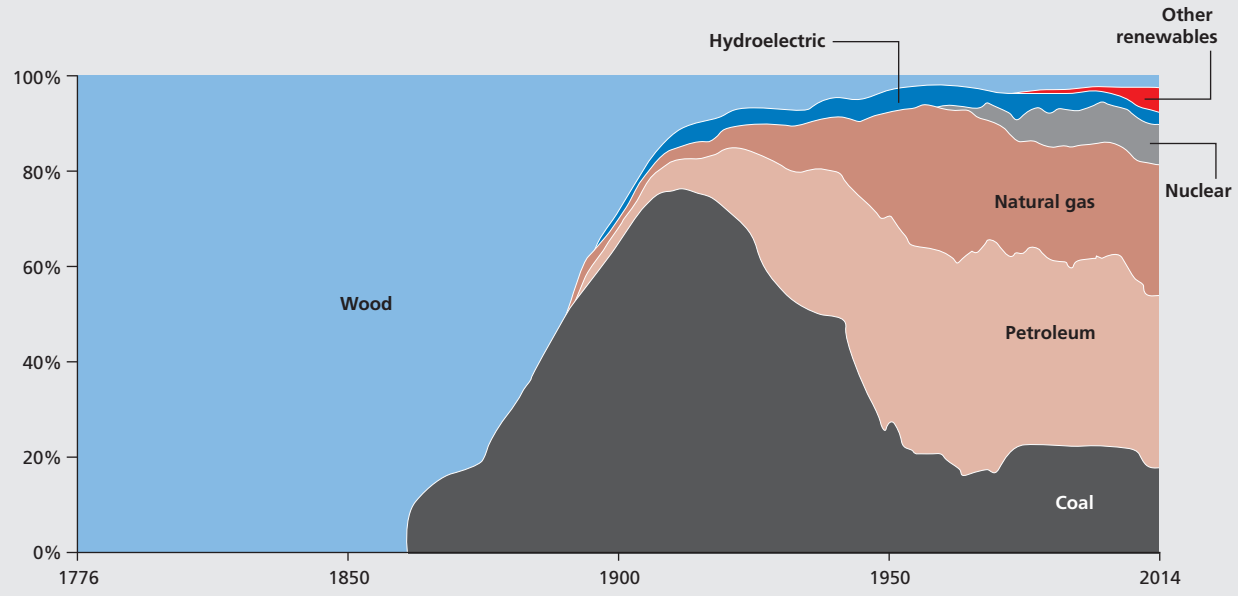
11%

Increase in fossil fuel consumption in the US, 1990-2014

But is his country thinking about that?

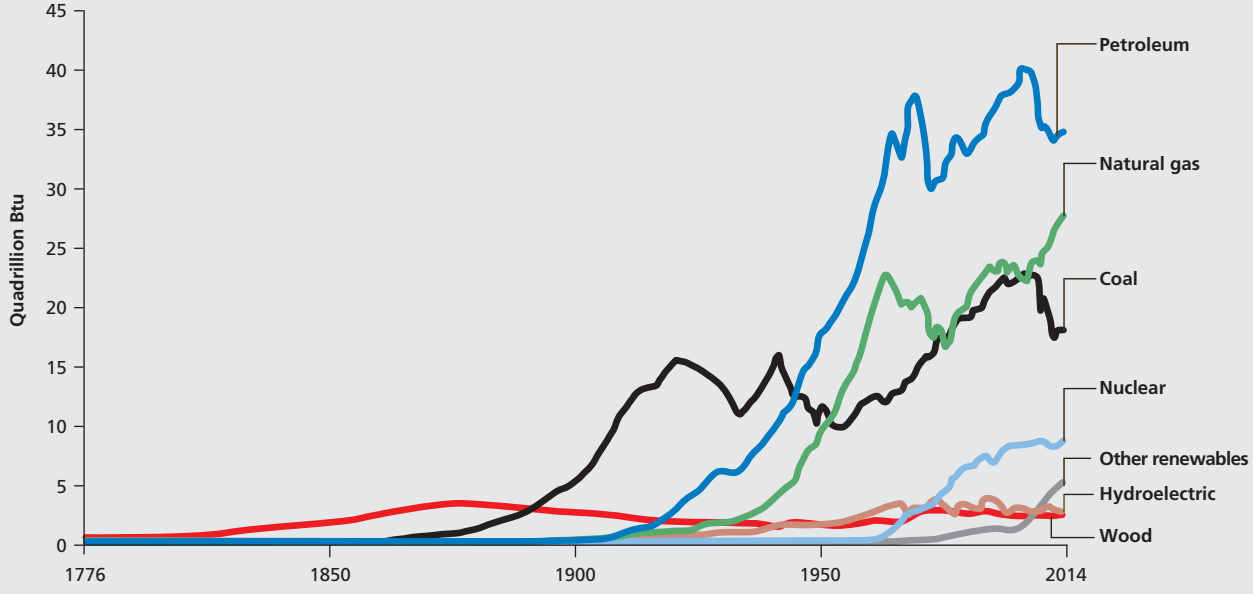
In terms of producing and consuming coal, not much has changed in the US. In 2014, coal consumption in the US was about 1 per cent higher than in 1990. However, coal consumption peaked in 2005, at about 1.02 billion metric tonnes (billion MT), and since then has reduced 19 per cent (see Graph 2.6: *Energy mix: coal use lesser*). Nevertheless, globally the US remains the second largest consumer of coal after China. Its per capita consumption is marginally higher than China and five times higher than India (see Table 2.1: *Coal countries consume*).

Graph 2.1: Share of energy consumption in the US (1776-2014)



Source: www.eia.gov/todayenergy/detail.cfm?id=21912, as viewed on July 2, 2015

Graph 2.2: Energy consumption in the US (1776-2014)

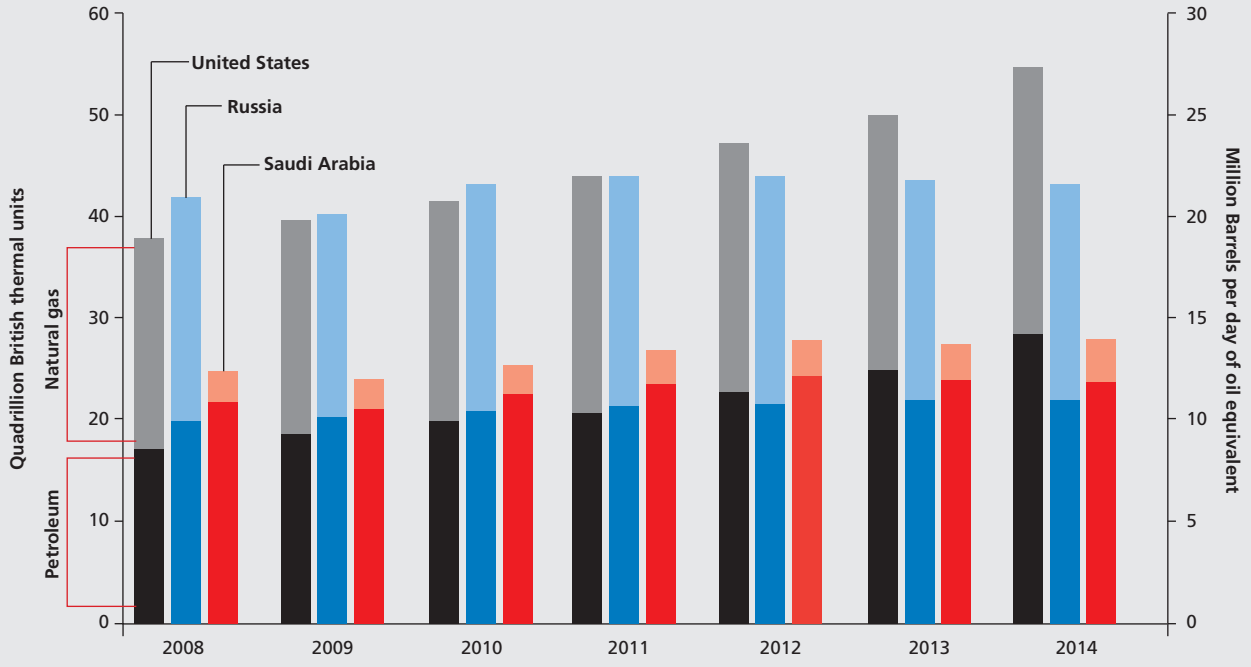


Source: www.eia.gov/todayenergy/detail.cfm?id=21912, as viewed on July 2, 2015

The United States has always been a fossil-fuel dominant economy. Three fossil fuels — petroleum, natural gas and coal — have always been favoured to produce energy.

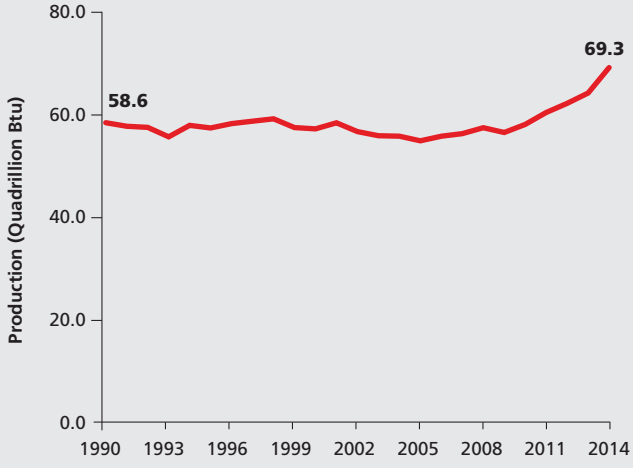
The scenario today remains the same. Today, these three fossil fuels form the absolute basis for energy production, accounting for 80 per cent of all the energy the US needs.

Graph 2.3: World's top producer of petroleum and natural gas

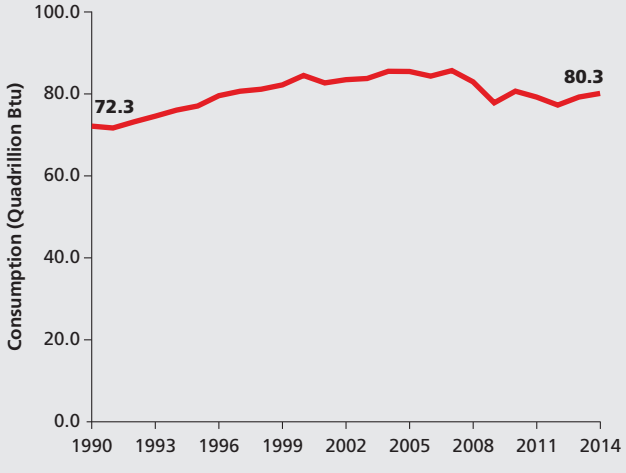


Source: www.eia.gov/todayenergy/detail.cfm?id=20692, as viewed on July 2, 2015

Graph 2.4: Fossil fuel production



Graph 2.5: Fossil fuel consumption



Source: Graphs generated by the Centre for Science and based on monthly and annual energy review published by US Energy Information Administration

Today, the US is the world's topmost producer of petroleum as well as natural gas. It produces more oil than Saudi Arabia and more natural gas than Russia.

Indeed, fossil fuel production in the US has only increased: from 1990 to 2014, up by 18.3 per cent. Fossil fuel consumption, too, has increased. 1990 to 2014, up by 11 per cent.

Natural gas: a new king is born

Natural gas consumption in the US today is at a historical high. Compared to 1990, consumption has risen 40 per cent (see Graph 2.7: *Energy mix: gas use is up*). Today, the US is by far the largest consumer of natural gas in the world. In 2014, it consumed natural gas to the tune of 695.3 million tonnes oil equivalent (mtoe), 22.7 per cent of what the world did.

Oil and cars go well together

US consumption of oil in 2014 was about 8 per cent higher than in 1990 (see Graph 2.8: *Energy mix: oil use also up*). However, like coal, consumption peaked in 2005 and is today about 11 per cent lower than 2005 levels. Even so, as with natural gas, the US remains the world's largest oil consumer. In 2014, it accounted for about 20 per cent of all the oil the world used.

22%

Natural gas the US consumed in 2014, as a percentage of what the entire world consumed

Shift to renewables is minor

The critical climate change choice is whether a country has finally begun moving away from fossil fuels to cleaner non-fossil fuel alternatives. In the US' case, the answer is a resounding no. US leaders love to talk big about their breakthrough on climate change. To make us believe they are finally 'decarbonising' growth. Reality shows otherwise.

The contribution of fossil fuels to primary energy consumption in the US has reduced from 85.6 per cent in 1990 to 81.6 per cent in 2014, by 4 per cent. Put another way, the contribution of renewable energy (including hydropower and biomass) has increased from 7.1 per cent to 9.8 per cent in this period. Yet, the hard fact is that the contribution of renewable energy — and this includes all hydropower and biomass power generation — has increased by just 3 per cent in the last 24 years (see Graph 2.9: *Energy mix: minor shift to cleaner alternatives*).

And still its allies argue the US is on track to tackle climate change. They point out that whereas the contribution of fossil fuels to primary energy produced is reducing, at 0.3 per cent per year, that of renewables is increasing 2.3 per cent per year. Isn't that fast-paced?

No. It's snail-paced. If this trend continues, in 2050 not more than 25 per cent of the primary energy consumed in the US will be from renewables. Definitely not what the world expects from the largest historical contributor to climate change.

Breakthrough?

'Decarbonisation' has at least two aspects. One, whether a country has moved to non-fossil fuels, made the transition. Two, whether it has reduced energy usage, i.e., de-linked growth from energy consumption and thus emissions. For the US, neither aspect holds good. First, fossil fuel use is gargantuan and out of sync with what the Planet can sustain. Second, even the little decrease visible in terms of per capita energy consumption can, in fact, be camouflage.

Graph 2.6: Energy mix: coal use

1990-2014, coal use stagnated

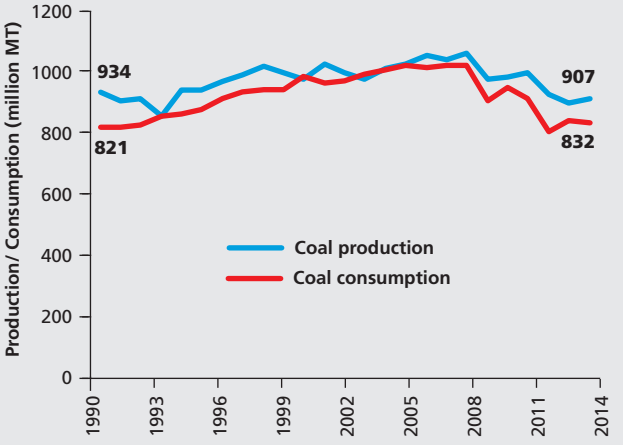


Table 2.1: Coal countries consume

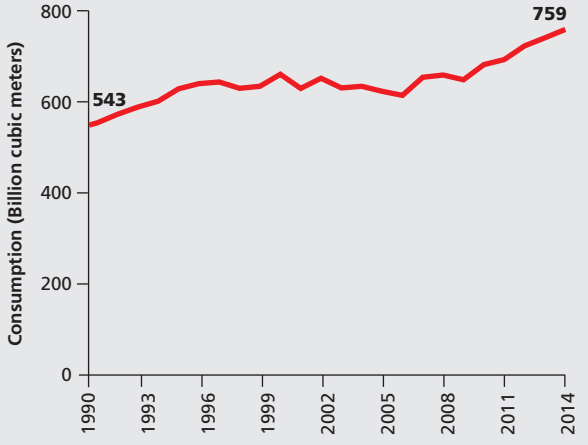
Per capita coal use highest in the US

Country	Coal consumption: 2014 (million toe)	Per capita coal consumption (toe) in 2014
US	453.4	1.47
Japan	126.5	1.0
Germany	77.4	1
China	1962.4	1.45
India	360.2	0.3

Source: BP Statistics, 2015[1]

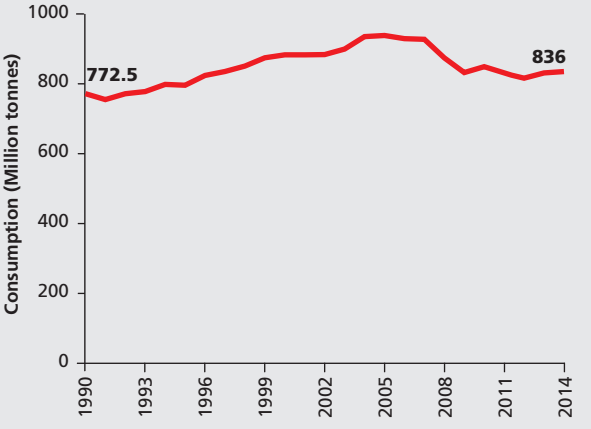
Graph 2.7: Energy mix: gas use

Rapid growth in gas use



Graph 2.8: Energy mix: oil use

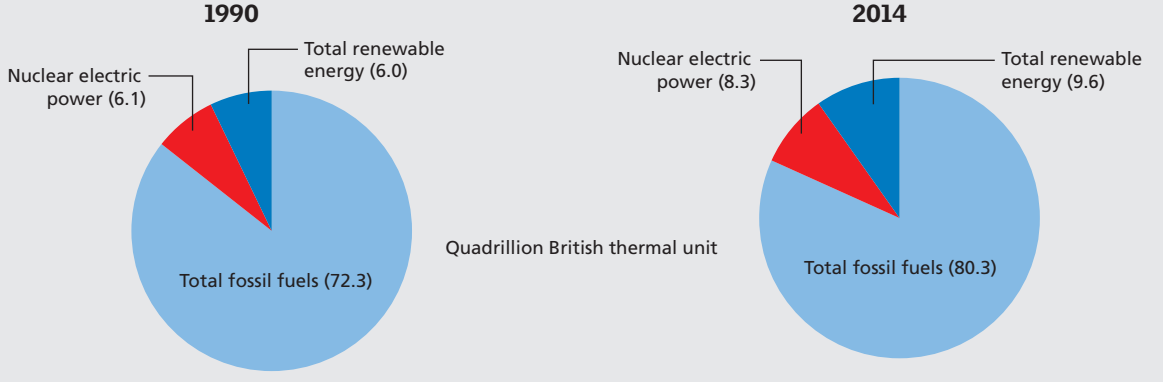
Peaked in 2005, then down



Source for 2.6-2.8: generated by the Centre for Science and Environment based on monthly and annual energy review published by US Energy Information Administration

Graph 2.9: Energy mix: renewables

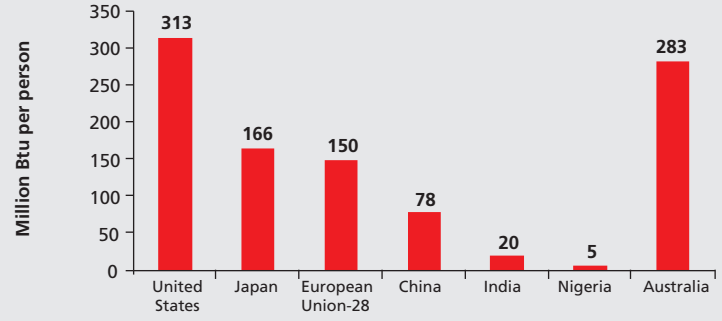
Minor shift to cleaner alternatives



Source: Graphs generated by the Centre for Science and Environment based on monthly and annual energy review published by US Energy Information Administration

Graph 2.10: Per capita primary energy consumption, 2011

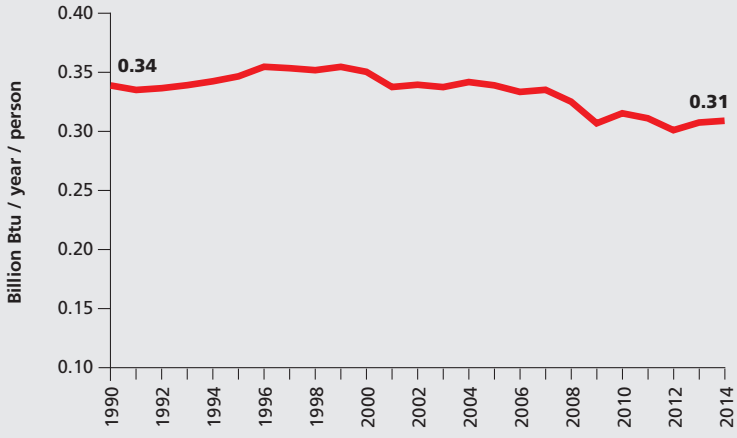
US has the highest in the world and the trend is hardly changing



Source: Graph generated by CSE based on International Energy Statistics, US Energy Information Administration

Graph 2.11: Trend in per capita energy consumption

Marginal drop in per capita energy



Source: Graphs generated by the Centre for Science and Environment based on monthly and annual energy review published by US Energy Information Administration

16%

Increase in primary energy consumption in the US, 1990-2014

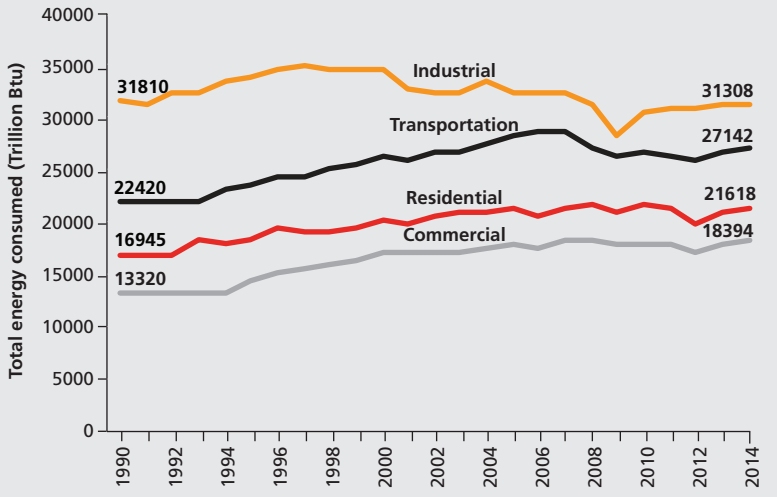
Primary energy consumption has grown from 84.5 Quadrillion British thermal unit (Quad) in 1990 to 98.5 Quad in 2014, up 16.5 per cent. It is important to understand this increase.

US per capita energy consumption is shockingly high, compared to countries with a similar economy and population. An American citizen consumes twice as much energy as a European, four times more energy than a Chinese and 16 times that of an Indian (see Graph 2.10: *Per capita primary energy consumption, 2011*). Moreover, such consumption is not reducing at a pace required to address climate change. While per capita consumption has reduced from 0.34 billion Btu in 1990 to 0.31 billion Btu in 2014, the annual rate of reduction is insignificant: 0.4 per cent (see Graph 2.11: *Trend in per capita energy consumption*). But this figure does not portray what's really happening.

Total energy consumption in the domestic, commercial and transport sectors — three big sectors — has increased since 1990 by 28 per cent,

Graph 2.12: Sector-wise energy consumption

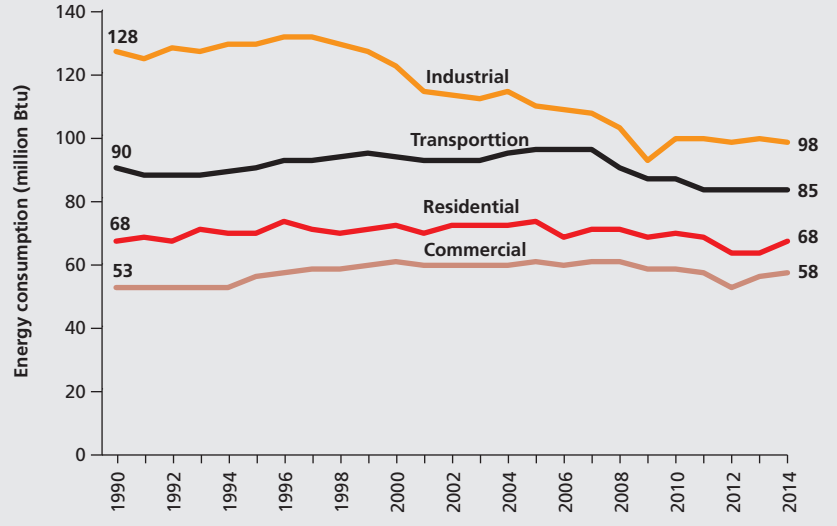
Post-slump US economy is picking up, sectoral energy use is also up



Source: Graphs generated by the Centre for Science and Environment based on monthly and annual energy review published by US Energy Information Administration

Graph 2.13: Sector-wise per capita energy consumption

In most sectors, there has been no change



Source: Graphs generated by the Centre for Science and Environment based on monthly and annual energy review published by US Energy Information Administration

38 per cent and 21 per cent respectively (see Graph 2.12: *Sector-wise energy consumption*). Co-evally, per capita energy consumption in these sectors has hardly reduced (see Graph 2.13: *Sector-wise per capita energy consumption*).

The industrial sector is the only one down. 1990-2014, its total energy consumption has gone down two per cent; per capita energy consumption is down 23 per cent. But, curiously enough, US Department of Commerce data shows that consumption of all goods, including

28%

Increase in total energy consumed by the US residential sector, 1990-2014

No Incentive to Reduce

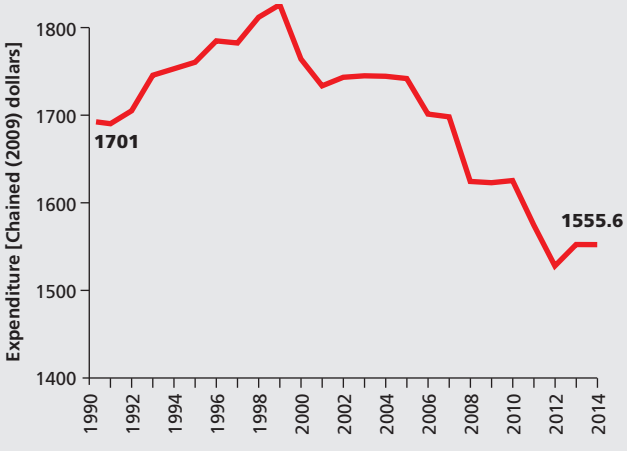
Real energy prices in the US are falling

An average individual in the US today spends less on energy than what s/he spent in 1990. The per capita real consumption expenditure — a measure of price changes in consumer goods — on energy has reduced from US $1,701 in 1990 to US $1,556 in 2014, down 8.5 per cent. In terms of its share in a person's spending basket, expenditure on energy is significantly down. In 1990, an average US citizen used to spend 7.2 per cent of her/his total annual expenditure on energy; in 2014, 4.7 per cent. An average US person therefore spends less than 5 per cent of her/his income on energy, one of the lowest in the World.

A key reason is reduced natural gas and electricity prices.

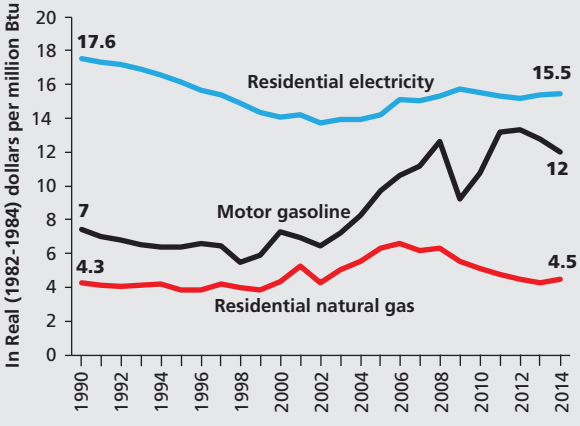
1990-2014, though the Urban consumer price index (Index 1982-1984 = 100) increased by 81 per cent, the per unit cost of residential electricity, in terms of Real (1982-1984) Dollars per million Btu, actually reduced 12 per cent. The unit cost of residential natural gas has remained more or less at 1990 levels. The cost of motor gasoline has increased 61 per cent. Therefore, in comparison to the increase in prices of other goods and services (as measured by the consumer price index), the price of electricity has reduced, that of natural gas stagnated and gasoline price has risen at a relatively lower rate. These reductions in prices are actually counterproductive to all efforts made to improve energy efficiency.

Graph 1: Per capita real consumption expenditure on energy



Source: Graph generated by Centre for Science and Environment based on data from Personal consumption expenditure by function, 1969-2014, Bureau of Economic Analysis

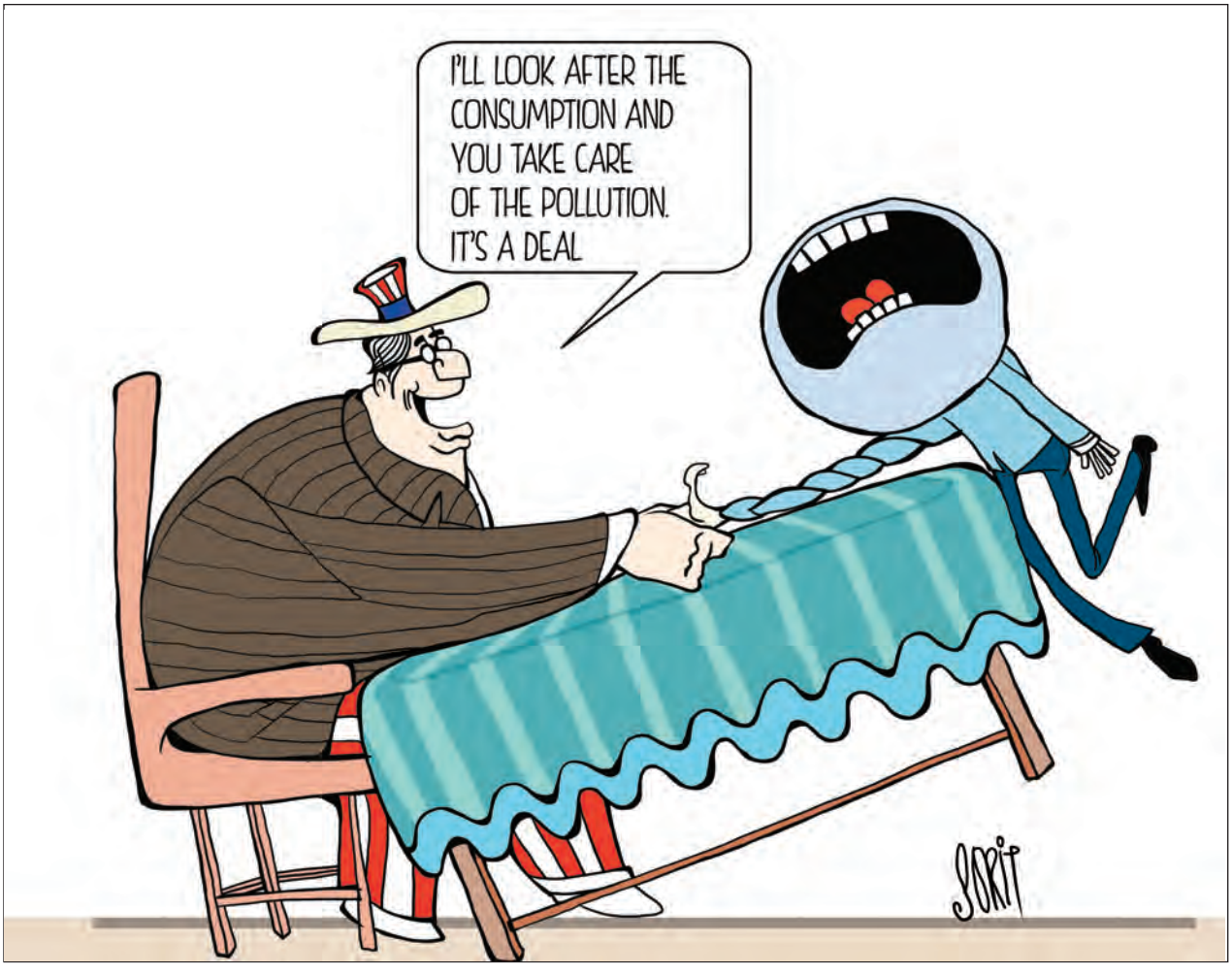
Graph 2: Cost of electricity and fuels to end users



Source: Graphs generated by the Centre for Science and Environment based on monthly and annual energy review published by US Energy Information Administration

industrial goods, has increased since 1990. What has 'changed' is that the US now imports more of the energy-intensive goods it so likes to consume (see: *Chapter 7: Industry*). The industrial sector's energy use has reduced only because manufacture has been outsourced. There is, therefore, no *prima facie* evidence to suggest the US has made a deliberate, planned effort to reduce energy consumption. Indeed, its energy pricing policy may be propelling more fossil fuel use (see Box: *No Incentive to Reduce*).

To understand the scenario better, let us go sector by sector. Read on.


I'LL LOOK AFTER THE CONSUMPTION AND YOU TAKE CARE OF THE POLLUTION. IT'S A DEAL
SORIT

- **Complete reliance on fossil fuels: In 1990, 69 per cent of all electricity the US produced was fossil-fuel based. In 2014, 67 per cent.**

- **Meagre shift to renewable sources of electricity generation: 1n 1990, 11.3 per cent electricity generated using renewables, including hydropower. In 2014, 12.7 per cent.**

- **US per capita elecricity consumption is double that of the European Union, four times that of China and 17 times higher than India.**

- **In 2013, US electricity sector accounted for a whopping 31 per cent of US total emissions. Since 1990, the sector's emissions are up 11 per cent.**

- **Coal-based power plants contribute less to the sector's emissions today, but the amount of coal used has increased. In 1990, the sector consumed 710 million metric tonnes (MMT) coal. In 2014, 772 MMT.**

- **In the US, natural gas is substituting coal. But CO_2 emissions from gas-based plants have increased, 1990-2014, by 150 per cent.**

- **Even if three per cent of methane is 'leaked' in the shale gas cycle, natural gas will lose its climate 'advantage' over coal.**

3. Light Years Away

US electricity sector alone can short-circuit climate action

It is now time to examine the various economic sectors that power the world's powerhouse. We begin with the electricity sector.

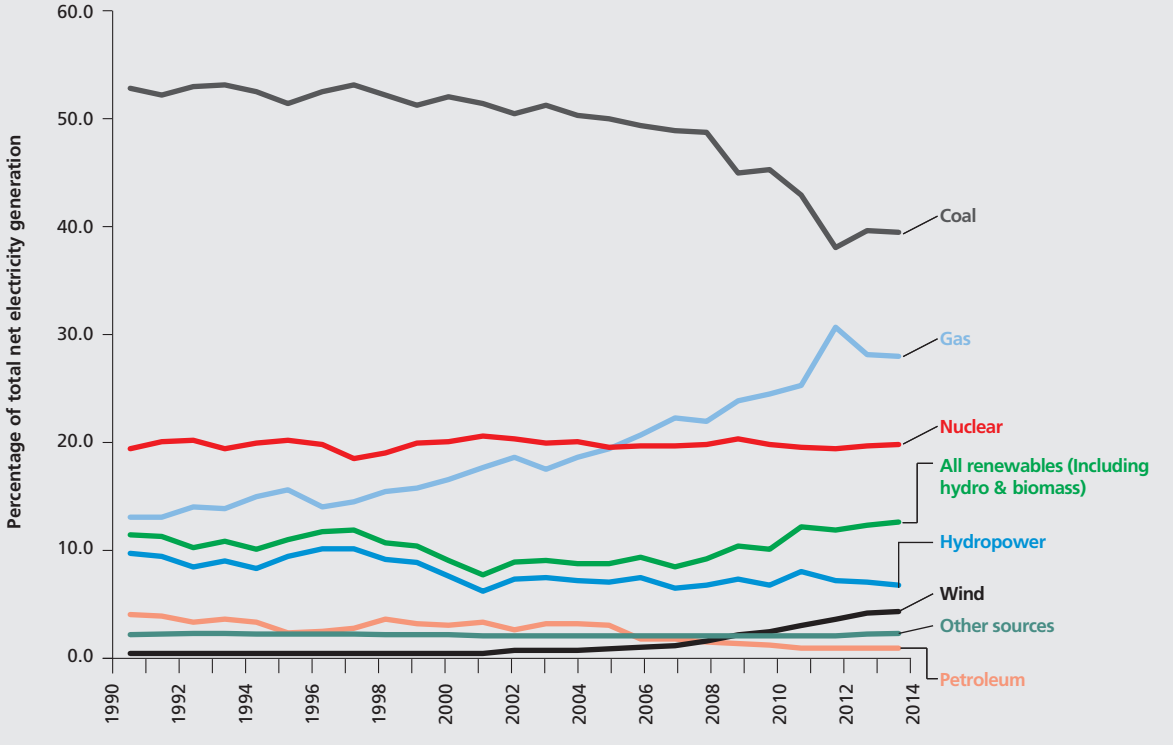
It's a thrummingbird. The first fact to note is that the US electricity sector utterly relies on fossil fuels. In 1990, 69 per cent of electricity came from fossil fuels; in 2014, 67 per cent.[1] Dependance is stagnant. The only change has been that the use of coal to produce electricity is down; natural gas use is up (see Graph 3.1: *Electricity generated from various sources*).

There has hardly been a shift in the share of electricity sourced from renewables. In 1990, electricity generated using renewables, including hydropower and biomass, was 11.3 per cent; in 2014, such use marginally increased to 12.7 per cent. Overall, the scenario is that electricity generation in the US is at an all-time high. Net electricity generation — what a power plant produces to sell — has increased 35 per cent since 1990.

Consumption, too, is at an all-time high, up 36 per cent since 1990

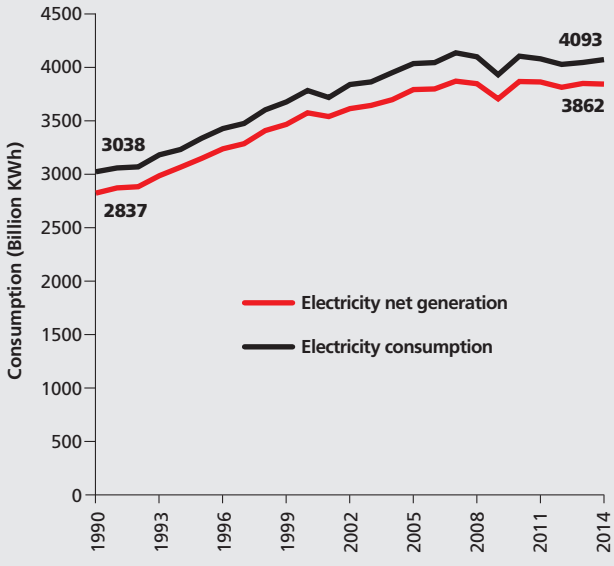
Graph 3.1: Electricity generated from various sources

Coal use is decreasing and gas use is really on the rise: the sector remains fossil-fuel dependent

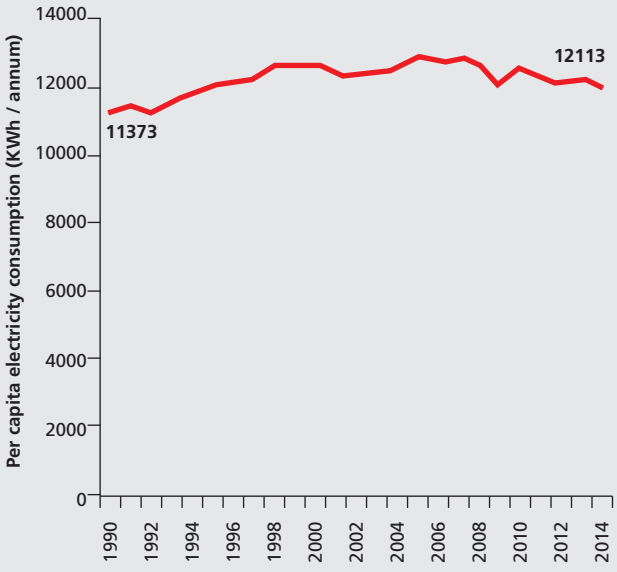


Source: Based on monthly and annual energy review published by US Energy Information Administration

Graph 3.2: Electricity generation and consumption in the US



Graph 3.3: Per capita electricity consumption



Source: Based on monthly and annual energy review published by US Energy Information Administration

(see Graph 3.2: *Electricity generation and consumption in the US*). An individual in the US today consumes more electricity than s/he did in 1990. Up from 11,373 kiloWatt hour (kWh)/annum in 1990 to 12,113 kWh/annum in 2014, a seven per cent increase. Indeed, per capita consumption reached an electrifying 12,900 kWh/annum in 2007 itself. Since then it reduced for various reasons, including economic freefall in 2009 (see Graph 3.3: *Per capita electricity consumption*).

In addition, US per capita electricity consumption is more than double that of the European Union (EU-28), forcing the question: why does the US need so much electricity, when its human development index and that of other rich nations such as in the EU-28 are comparable? Its electricity consumption is almost four times of China and 17 times higher than India (see Table 3.1: *Why so much?*). Why?

Cheap electricity is the prime driver for gluttonous consumption. Sans commas, forget full stops. As electricity prices fall, consumption goes up. This tango is unstoppable (see Graph 3.4: *Cheaper electricity*

Table 3.1: Why so much?

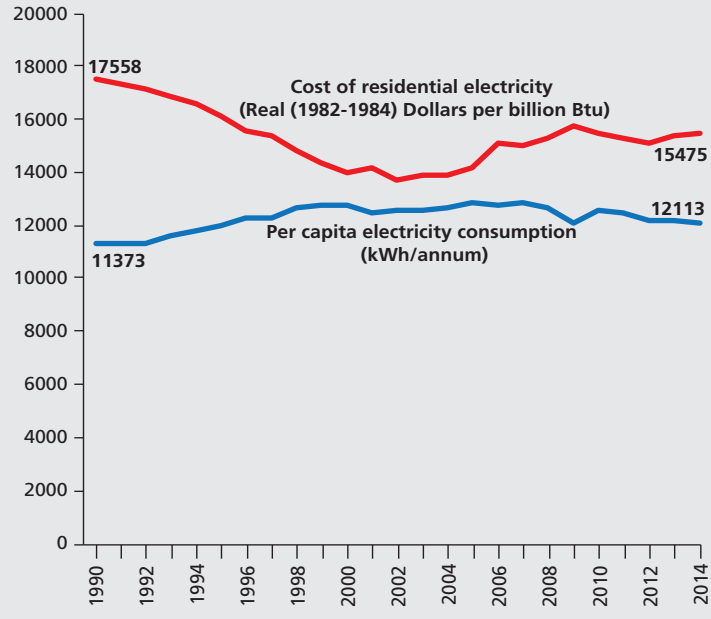
An American consumes on an average four times more electricity than a Chinese

Metrics	US	EU-28	India	China
Per capita electricity consumption (KWh)	12200	5738	684	3298

Source: Enerdata, 2013

Graph 3.4: Cheaper electricity driving consumption

The price-consumption correlation is a strong 0.9



Source: Based on monthly and annual energy review published by US Energy Information Administration

driving consumption). The net effect of growing electricity consumption is that greenhouse gas (GHG) emissions from the US electric power sector are up by about 11 per cent since 1990. In 2013 the electricity sector, spewing 2,100 million metric tonnes of carbon dioxide equivalent (MMT CO_2e), was the single largest source of GHG emissions (see Graph 3.5: *Electricity sector emissions trends*). The sector accounted for a whopping 31 per cent of the country's total emissions (excluding LULUCF).

CO_2 emissions comprise the vast majority of GHG emissions from this sector: 97.6 per cent. Methane (CH_4) and nitrous oxide (N_2O) emissions make up the rest.

Coal: No 1 go-to fossil fuel

In 2014, 93 per cent of all coal used in the US was in the electricity sector (the rest was largely used in the industrial sector; see Chapter 6). In 2014, coal-based power plants accounted for 38.7 per cent of all electricity generated; in 1990, its contribution was 52.5 per cent. This statistic is true, but misleading. 1990-2014, the *amount* of coal used has increased over these 24 years.

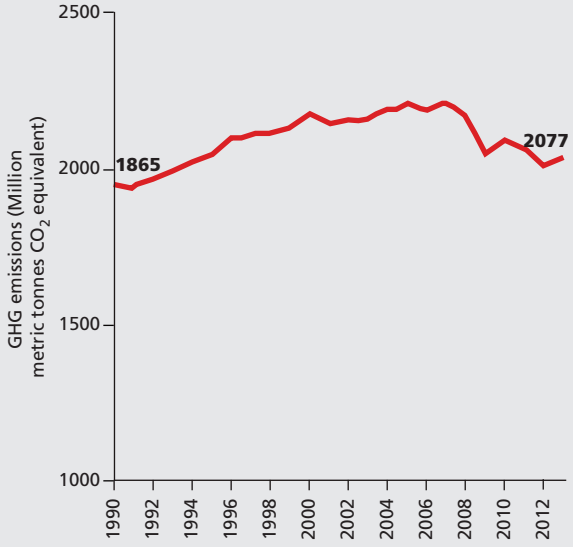
In 2014, the electricity sector consumed 772 MMT coal; in 1990, 710 MMT. In all the electricity generated in the US, the proportion of coal-based generation may have reduced. But generation itself has increased, and so coal use — climate change's problem parent (see Graph 3.6: *Coal Consumed by the Electric Power Sector*).

772

In million metric tonnes, amount of coal used in the US electricity sector, 2014

Graph 3.5: Electricity sector emissions trends

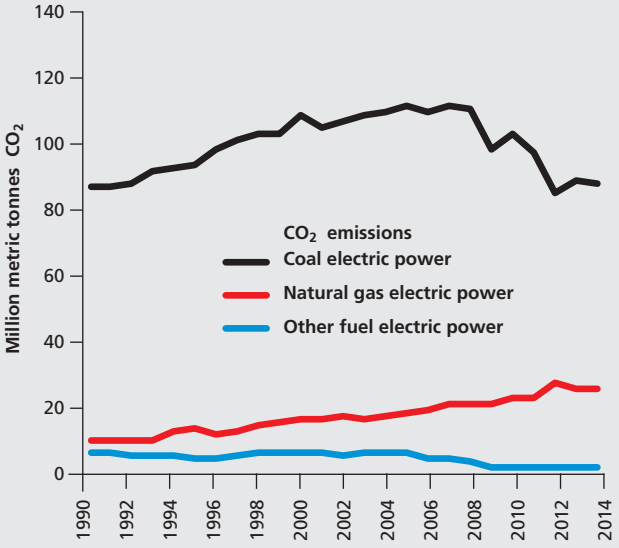
11 per cent more then 1990



Source: Based on US Greenhouse Gas Inventory of the Environmental protection Agency.

Graph 3.7: CO_2 emissions from differently fuelled power plants

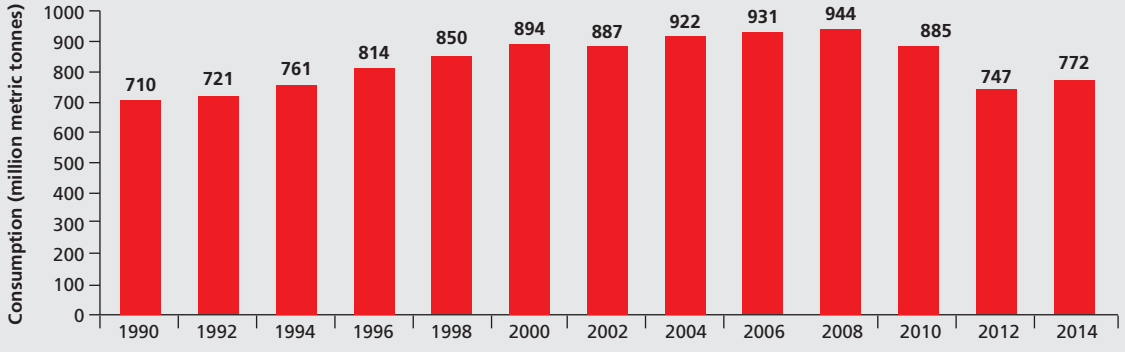
Coal emission down, gas emission up



Source: Based on monthly and annual energy review published by US Energy Information Administration

Graph 3.6: Coal Consumed by the Electric Power Sector

Coal use may have reduced, but the amount of coal used remains staggeringly high



Source: Based on monthly and annual energy review published by US Energy Information Administration

Spew Quotient

The contribution of coal-based power plants to all the CO_2 the US emits from electricity generation has reduced, from 85 per cent in 1990 to 77 per cent in 2014.

Again, here is a statistic that is true but does not provide the real picture. For, in terms of total emissions, coal-based plants continue to emit as much CO_2 as they did in 1990 — about 1.5 billion tonnes (see Graph 3.7: *CO_2 emissions from differently fuelled power plants*). In

absolute terms, since the use of coal simply hasn't reduced, neither have the sector's CO_2 emissions.

Efficiency Quotient

If the spew quotient of coal-based power plants in the US is high, their efficiency quotient is the exact opposite. The US has the world's second largest coal-based power plant installed capacity (after China); in 2013, a little more than 329 giga-watts. And most of these plants are old and inefficient.

According to the US Energy Information Administration (EIA), by 2010-end, approximately 73 per cent of US coal-fired power plants were 30 years old, or older. Centre for Science and Environment analysis, based on 2014 data EIA has published, found the average weighted-age of all coal-based power plants in the US to be 39 years.

Old means inefficient (see Infographic: *The Big Belch*). Indeed, US power plants are less efficient than power plants in the Nordic group of nations, Germany, Japan, Australia and even South Korea. Japan and the Nordic group of countries top the list, at 42 per cent and 40 per cent efficiency respectively. (The 'efficiency' of a power plant is the percentage of the total energy content of a power plant's fuel that is converted into electricity.) Average efficiency of US coal-based power plants, by contrast, was 35.8 per cent. Indeed, in the US at present, plants can't go beyond 40 per cent efficiency. In comparison, China's best plants have achieved efficiency as high as 44 per cent.

There are nearly 6,000 electricity-generating facilities in the US, but most of the sector's global-warming pollution comes from a handful of exceptionally dirty power plants. In 2011, the 50 dirtiest US power plants belched 30 per cent of all US electricity sector CO_2 emissions, 12 per cent of total US energy-related emissions, and 2 per cent of worldwide energy-related emissions. If these 50 were an independent nation, they would be the seventh-largest emitter of CO_2 in the world, behind Germany and ahead of South Korea. And if all power plants comprised a separate country, that 'nation' would be the third most polluting country after China and the US (see Infographic: *The Big Belch*).

De-commissioning these 50 power plants should have been the biggest historical polluter's first task. That hasn't happened. And given the present policy trajectory, that seems impossible.

40%

Maximum efficiency of a coal-based power plant in the US

44%

Efficiency the best coal-based power plants achieve in China

Natural gas: the new-pretender fossil fuel?

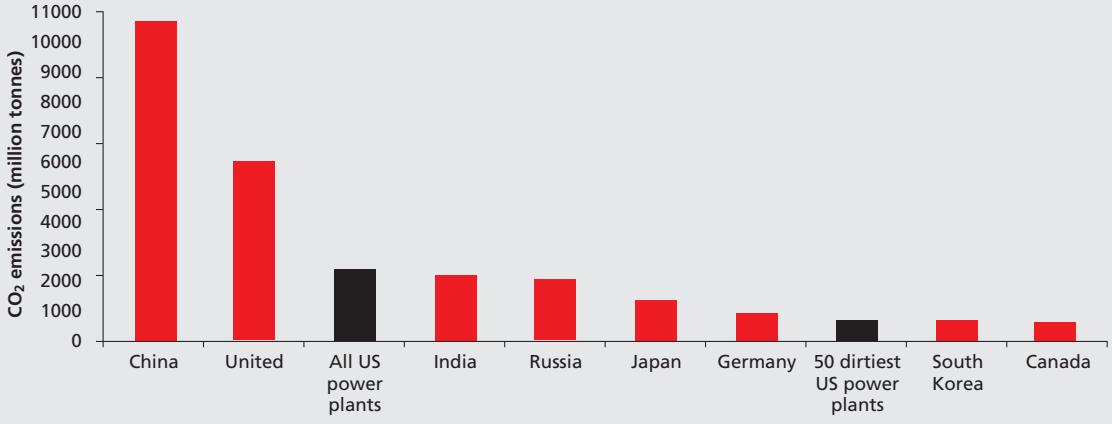
In all the energy the US electric power sector used up, 1990-2014, natural gas contribution has doubled: 11 per cent to 22 per cent. Electricity generated using natural gas has increased from 12.3 per cent of all the electricity the sector generated, in 1990, to 27.4 per cent in 2014. In tandem, coal's contribution to all electricity generated has come down, from 52.5 per cent to 38.7 per cent. It is evident that in the

The Big Belch

The US's war against coal is NOT at home

WHAT ALL POLLUTE: MILLION TONNES OF EMISSIONS IN 2013

If all US power plants were a country, it would be the third highest polluter in the world. If the 50 dirtiest power plants were a nation, that country would be the 8th largest emitter of CO_2 in the world. Just behind Germany, and just ahead of South Korea.



Sources: Environment America Centre, 2013

The US has the world's second-largest coal-based power plant capacity, after China.

Per capita coal consumption in the US is 5 times more than India.

Most power plants are more than 30 years old. The average weighted age of all US coal-based power plants is 39 years.

OLD MEANS INEFFICIENT:

US coal-fired power plants are less efficient than those in the Nordic group of nations, Japan, Germany, Australia, even UK-Ireland.

Sources: Heat on Power, CSE, 2015

US, natural gas is substituting coal (see Graph 3.8: *Contribution of electricity from coal and natural gas*).

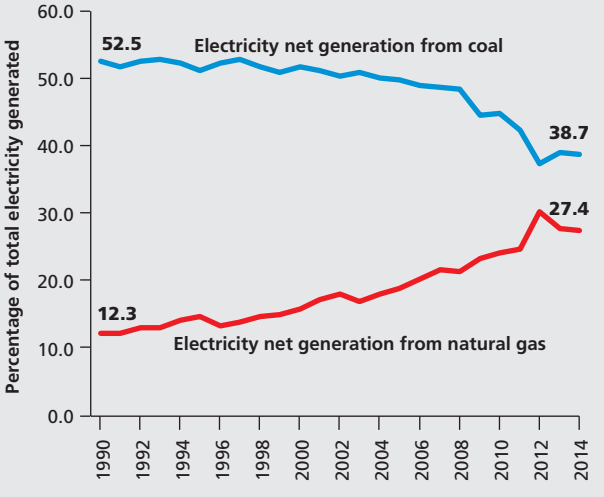
But what kind of a substitute is it? CO_2 emissions from gas-based plants have further upped the sector's spew quotient. In 2014, 22 per cent of all CO_2 the sector emitted was from gas-based plants; in 1990, it was just 10 per cent. This sub-sector, then, has seen a CO_2 emissions increase of 150 per cent in the last 24 years. If current US policy and regulation are to be believed, it will keep occurring. Hence, it is important to understand the nature of the substitution.

Gas-based power plants are cheaper to operate than coal-based ones. In 2012, a gas-based plant spent, on average, US $35.67 to produce one megawatt-hour of electricity. A coal-based plant spent more: US $ 37.20. Thus, gas has a competitive advantage over coal (see Graph 3.9: *Average power plant operating expenses: 2012*).

This edge is likely to continue. In 2020, the levelized cost of electricity (the per kilowatt-hour cost of building operating a power plant over an assumed financial life and performance cycle) from a new gas-based power plant is estimated to be significantly lower than a coal-based power plant. In fact, in 2020, the cheapest way to produce electricity in the US will be to build an Advanced Combined Cycle Gas-based power plant. A coal-based power plant in 2020 will produce electricity at a cost 30 per cent higher than gas (see Graph 3.10: *Estimated levelized cost of electricity from new power plants in 2020*).

Graph 3.8: Contribution of electricity from coal and natural gas

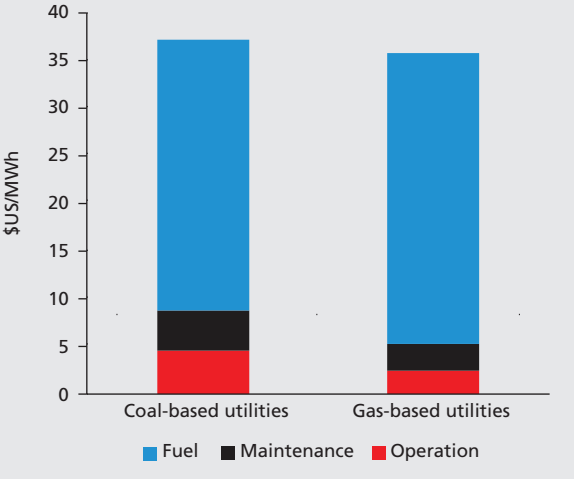
A matter of time before gas use overtakes coal use



Source: Based on monthly and annual energy review published by US Energy Information Administration

Graph 3.9: Average power plant operating expenses: 2012

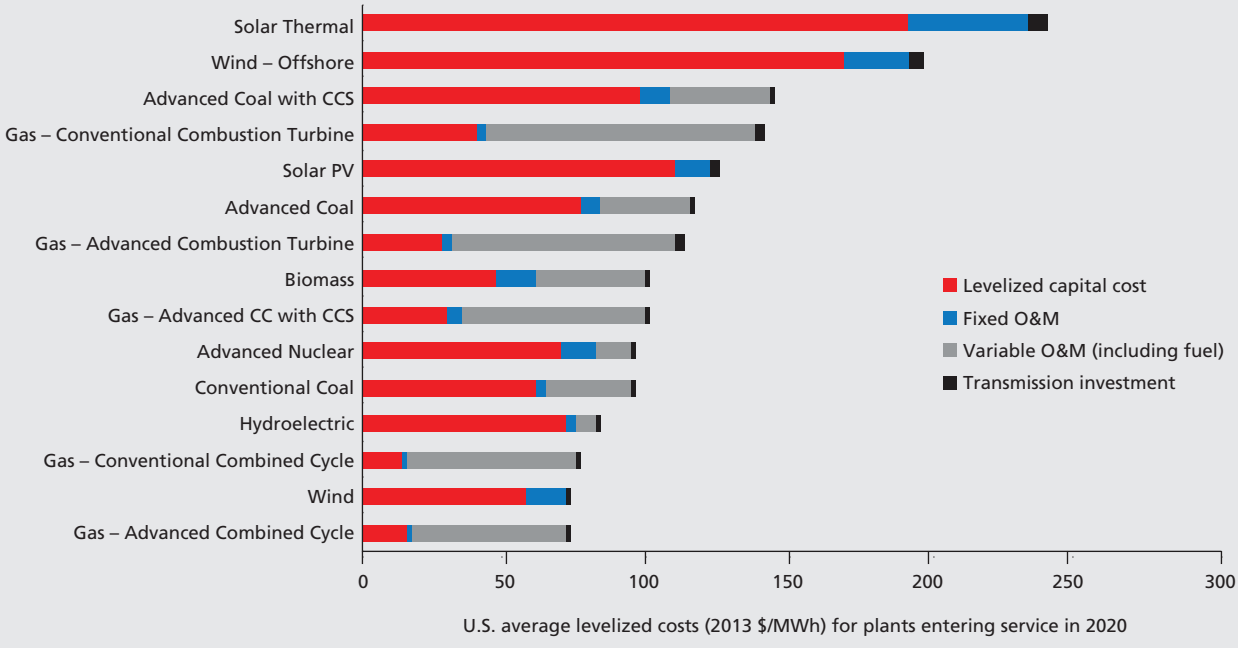
Gas-based ones win hands down



Source: http://www.eia.gov/electricity/annual/html/epa_08_04.html, as viewed in August 2015

Graph 3.10: Estimated levilized cost of electricity from new power plants in 2020

In 2020, a coal-based power plant will produce electricity at a cost 30 per cent higher than a gas-based one



Source: Annual Energy Outlook 2015, US Energy Information Administration

Policy direction: more gas

US policy direction for the future does not in any way discourage setting up new power plants, coal- or gas-based. In August 2015 the US Environment Protection Agency (EPA) released emissions standards for new, modified and reconstructed power plants. Under these standards, new gas plants are required to meet 453 kg CO_2/megawatt-hour (MWh), while coal plants will need to meet 635 kg CO_2/MWh. So what kind of standards are these? As per EPA itself, a Combined Cycle gas plant — the technology that is widely used and is the cheapest to build and operate — will meet this new standard.

Another way to look at these standards is to compare it with another country. The standard the EPA has set in 2015, for the future, is equivalent to the standard gas-based power plants in India were already meeting in 2009. As *Challenge of the New Balance* — a 2010 report of the Centre for Science and Environment — clearly shows, average emissions of gas-based plants in India were 470 kg CO_2/MWh, with many plants as low as 410 kg CO_2/MWh. In other words, the emissions standards for gas-based power plants (new, modified, or reconstructed) EPA has set is even poorer than what old gas-based power plants meet in India.

New coal plants, on the other hand, are going to have a tough time in the US. A new coal plant, to meet these standards, must be highly efficient. It must be of the 'supercritical' category of power plants, the

Why the US is so happy about gas

Supply is abundant and prices are low. The US will soon become net exporter of natural gas

2013 was a record year for natural gas production in the US. For the first time in its history, gross natural gas production crossed 30 trillion cubic feet (Tcf). The US, traditionally, relied on imports to meet its natural gas needs. Now, it was on the verge of becoming self-sufficient. Not only that. It was touted to become an exporter — no less — of natural gas by 2020. Gas prices in the US are at a record low, reflecting robust growth in production and record high gas inventories.

About 40 per cent of the gas the US is now gregariously producing comes from a source barely thought to be a commercially viable just a decade back: shales, a rock formation. The gas is called shale gas.

The Energy Department estimates the US has 880 Tcf of technically recoverable shale gas. Such a stock, combined with other oil-and-gas resources, could last two centuries. Truly turning an energy-gobbling country energy-sufficient. US shale gas production has increased 12-fold over the last decade. This trend is expected to continue through at least 2035, rising from 5 Tcf in 2010 (23 per cent of total US dry gas production) to 13.6 Tcf per year in 2035 (49 per cent of total US dry gas production).

The upsurge of cheap shale gas in the US has even made the IEA nervous. Fatih Birol, chief economist of the IEA has gone on record and said: "If gas prices come down, that would put a lot of pressure on governments to review their existing renewable energy support policies... We may see many renewable energy projects put on the shelf." Birol said the world must continue to invest in renewables, energy efficiency and carbon capture and storage, in order to stave off climate change. If the world fails to invest in renewables, a new generation of gas-fired power stations would have a lifetime of at least 25 years, effectively "locking in" billion of tonnes of carbon emissions a year.[1]

kind that uses pulverised coal with partial carbon capture. Such plants are expensive, for their operational costs are higher.

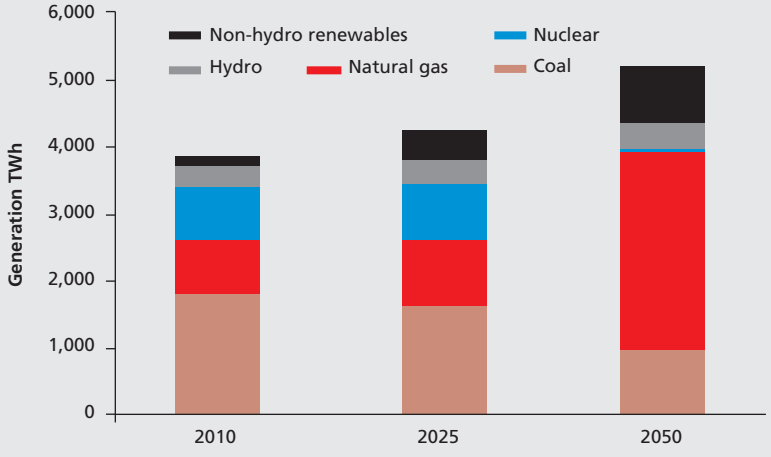
What are we to make of the EPA's — and so, the US's — stance regarding natural gas? Why is the US allowing so much natural gas in its energy mix for the future? One reason is the shale gas boom is on and there is no indication it will flag (see Box: *Why the US is so happy about gas*). The other is that cost rules, not climate change. The use of natural gas enables utilities to produce more electricity more cheaply. Whatever the scenario — business-as-usual or those the Energy Information Administration (EIA) has modelled in its analysis of the Clean Power Plan (see Section: *Obama on Overdrive*) — the US electric power sector is projected to depend more and more on natural gas power plants.

The EIA has modelled four scenarios, on what could happen in the sector under the Clean Power Plant (CPP). Natural gas production is projected to increase by 75-100 per cent by 2030 from 2005 levels. By 2030, it is projected, natural gas will be the single largest energy source to produce electricity — about 30 per cent of all electricity generated.

A 2012 study by the Union of Concerned Scientists (UCS) — an independent institution — projects even higher natural gas use (see Graph 3.11: *Projections of natural gas consumption*). According to this study, if current trends persist, natural gas will account for nearly two-thirds of US electricity by 2050.[2] Since demand is going to rise and fossil fuels will continue to dominate the electricity sector in the years to come, says the

Graph 3.11: Projections of natural gas consumption

In the future, natural gas will be the go-to source to produce electricity



Source: Report by 'Union of Concerned Scientists', 2012

UCS report, CO_2 emissions in 2050 are going to be 5-25 per cent higher than 2013. UCS cites a study by EIA where, similarly, it is said that in this natural gas use scenario, CO_2 emissions are going to increase by 12 per cent over 2012 levels by 2045. In sum, the switch from dirty coal to cleaner gas will not make a significant difference in the electricity sector's GHG emissions.

Will gas be good for climate?

Is gas better or coal, so far as climate change action is concerned? In most modelling studies, large-scale use of natural gas is not associated with any significant reduction in GHG emissions by 2050. *Nature*, for instance, published a major study in 2014.[3] The study simulates five state-of-the-art integrated assessment models of energy-economy-climate systems. It found that an abundant gas scenario — additional natural gas consumption of up to +170 per cent by 2050 — actually led to a much smaller impact on CO_2 emissions, from –2 per cent to +11 per cent. A majority of the models, *Nature*'s study shows, reported a small increase in climate forcing, from –0.3 per cent to +7 per cent, associated with increased use of abundantly available gas.

A major study published by the Stanford's Energy Modeling Forum, which convened 50 experts and 14 different modelling teams from industry, academia, and government to look at how the surge in natural gas production could transform the US economy, found that a boom in shale gas would not lead to any significant reduction in GHG emissions from the US. Most experts in the Stanford study expect natural gas to displace not only coal, but also nuclear and renewable energy between now and 2035.[4] A low natural gas price in the US is also likely to reduce investments in energy efficiency.[5]

11%

The tiny impact gas use has on carbon dioxide emissions

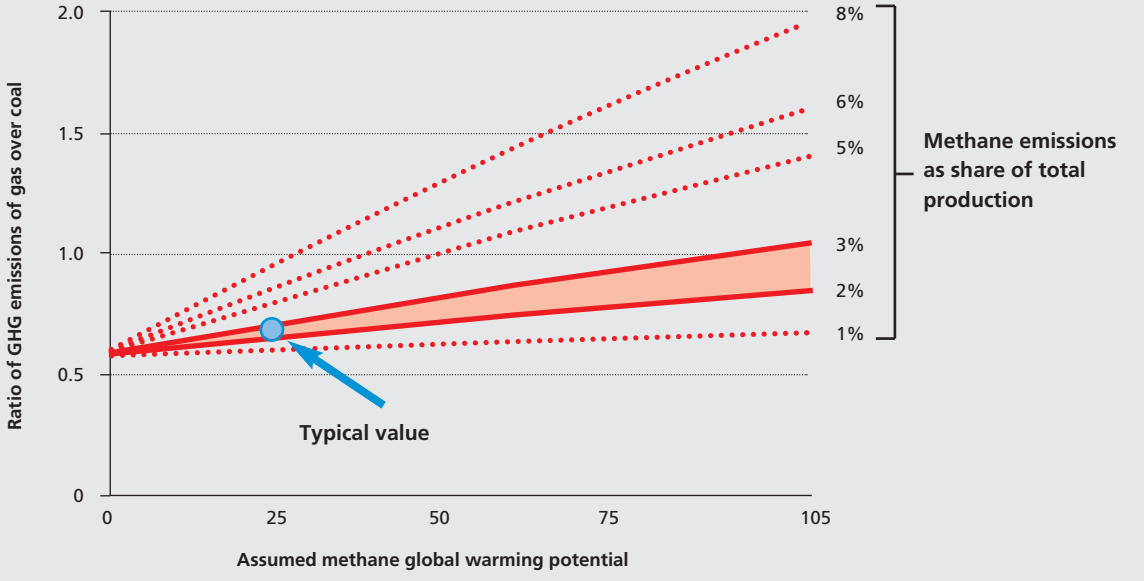
According to the International Energy Agency (IEA), a high unconventional gas scenario (called the Golden Rule scenario), in which natural gas constitutes 25 per cent of the global energy supply and unconventional gas production (gas produced from unconventional sources; shale gas is a good example) triples by 2035, does not lead to any significant reduction in energy-related CO_2 emissions.[6] IEA also concludes "greater reliance on natural gas alone cannot realise the international goal of limiting the long-term increase in the global mean temperature to two degrees Celsius above pre-industrial levels. Achieving this climate target will require a much more substantial shift in global energy use".[7]

IEA's caution is warranted, and timely. Natural gas, particularly when sourced from shale rock formations (and so, called shale gas), has far worse climate impacts than what was once assumed. For instance, much higher methane is emitted during the life cycle of shale gas, from production to use. Methane is more potent, but has a lower half-life: it does not stay as long as CO_2 does in the atmosphere. Averaged over 100 years — the number of years a molecule of CO_2 persists in the atmosphere — the GWP of methane is 25. But averaged over 20 years only, methane's ability to provoke global warming could be as high as 72.[8] Some studies have pegged it at 105, making it a really potent gas in the short term.[9]

According to IEA, if the GWP of methane is estimated to be 105, even if three per cent of shale gas is 'leaked' from the point it is produced in

Graph 3.12: Climate impacts of shale over coal

The 'leakage' of methane in the shale gas produce-to-use cycle could stymie US climate action plans



Source: Golden Rules for a Golden Age of Gas, World Energy Outlook Special Report on Unconventional Gas, International Energy Agency, 2012

wells through when it is piped to when it is used in power plants or homes, shale gas will lose all its advantage over coal. So minute a leakage is enough to make shale gas as potent a climate villain as coal (see Graph 3.12: *Climate impacts of shale over coal*).

Indeed, studies in the US are already highlighting the problem. As much as 3.6 to 7.9 per cent of the total gas output from a shale gas well is lost through fugitive methane emissions. Compared to coal, then, the footprint of shale gas could be at least 20 per cent greater. Perhaps more than 200 per cent greater on a 20-year time scale.[10]

The US government now — belatedly — wants to control methane emissions. On January 14, 2015, EPA announced a goal to cut methane emissions from the oil and gas sectors by 40-45 per cent below 2012 levels by 2025. EPA is planning to use existing laws like the New Source Performance Standards to set norms for methane and volatile organic compound emissions from the gas sector. The draft standards EPA announced will be finalised in 2016. But such standards will not add up.

Even in CPP, it is expected there will be a 22 per cent increase in primary energy production from 2013 to 2030. And so, even as coal is replaced by natural gas, usage of the latter will increase and negate any gains made because of the low carbon intensity of this 'bridge-fuel' — as its votaries, including President Obama,[11] call natural gas, meaning the fuel that will act as a bridge in the energy-transition from coal to renewable, to a 'cleaner' future.[12] In fact, if the scenarios such as *Nature* or the EIA have modelled hold, then in 2050, emissions from the US electric power sector will be equivalent to its current emissions.

22%

Projected increase in primary energy production, 2013 to 3030, negating gains of the US flagship plan to improve emissions from the electricity sector

What's more of a worry is that experts believe shale gas will stymie the growth of the renewable energy sector for decades to come.[13]

It is clear as crystal. The US policy direction is all wrong. Without a substantial, and meaningful, switch to renewables combined with steep cuts in energy consumption, the US will not make the gains the world so desperately needs, or what the US itself — increasingly desperately — insists it is on the verge of achieving.

Renewable energy

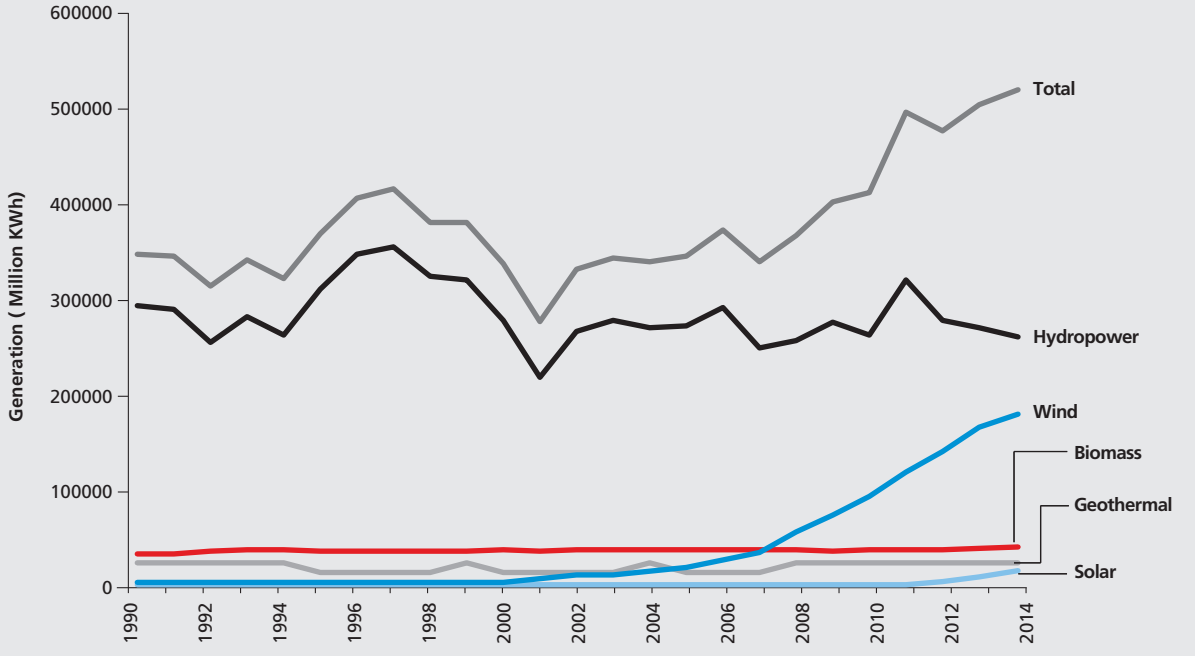
By 2014, electricity produced from renewable sources in the US increased by about 50 per cent since 1990 (see Graph 3.13: *Growth in renewable electricity generation*). The annual growth rate of renewable electricity production has been about 1.7 per cent since 1990.

But, the annual growth in total net electricity generation in the US during 1990-2014 was 1.25 per cent. So, renewable electricity production is growing at a marginally higher rate than total electricity production. The result: the share of renewable sources used in generating electricity has not changed much since 1990. Renewable energy sources provided 12.7 per cent of total electricity in 2014, barely up from 11.3 per cent in 1990.

The conclusion is simple: electricity from renewables is growing, but not rapidly enough. This sub-sector remains a small part of overall

Graph 3.13: Growth in renewable electricity generation

The US focus is to rely only on market-decided cheaper renewables. Solar remains a strict no-no



Source: Based on monthly and annual energy review published by US Energy Information Administration

electricity production and consumption in the US.

Moreover, if hydropower — a 'traditional' source of electricity in the US — is taken out of the renewables equation, the contribution of renewables like solar, wind and biomass is even smaller (about 6.5 per cent of the total electricity generation). So far, non-hydro renewables remain a small part of the US energy-mix story.

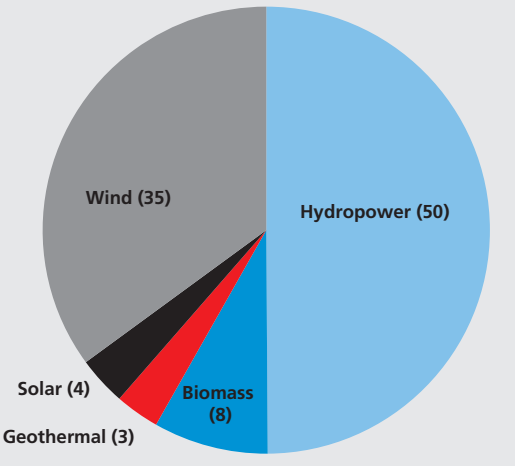
Changing source of renewable electricity

There has been a change in the sources of renewable electricity in the US. In 1990, about 85 per cent of renewable electricity was generated from hydropower. This has reduced to 50 per cent in 2014 (see Graph 3.14: *Share of different renewables, 2014*). In 2014, wind produced about 35 per cent of total renewable electricity, up from 1.0 per cent in 1990. So, wind power has grown at a tremendous pace, especially after 2005. The contribution of another important renewable source, solar power, has remained miniscule.

The change in the mix of renewables in the US

Graph 3.14: Share of different renewables, 2014

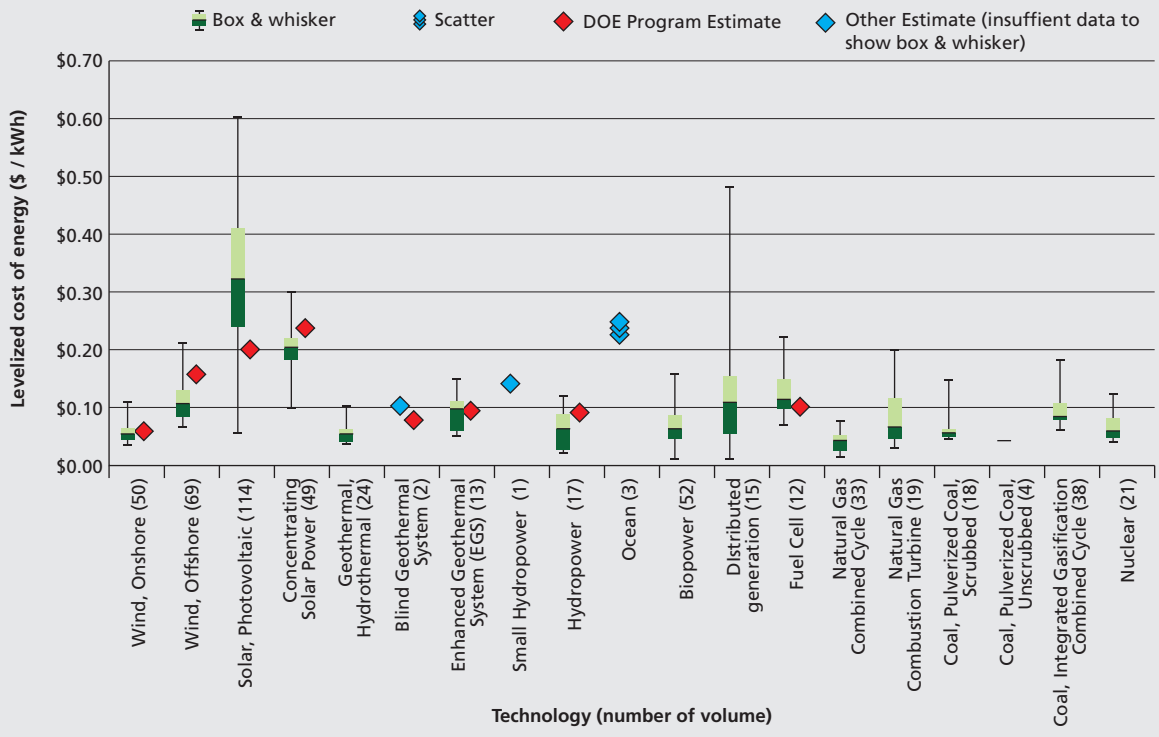
Wind is popular today in the US



Source: Based on monthly and annual energy review published by US Energy Information Administration

Graph 3.15: Levelized cost of electricity from various energy sources: 2009-2014

Wind costs less then US $0.5



Note: The levelized cost data is for data points generated from 2009 to 2014 and reflects the costs for the year 2009 to 2014.

Source: Transparent cost database, Open Energy Information, http://en.openei.org/apps/TCDB/ as viewed on September 22, 2015

reflects a price factor. United States has moved to wind in the last 10 years because wind has become cheaper. It is not moving to solar, because it is expensive. In fact, the cheapest way to produce electricity in the US is through Onshore wind power and natural gas Combined Cycle power plants. Both of them are growing at the fastest pace. Pure economics; no altruism (see Graph 3.15: *Levelized cost of electricity from various energy sources: 2009-2014*).

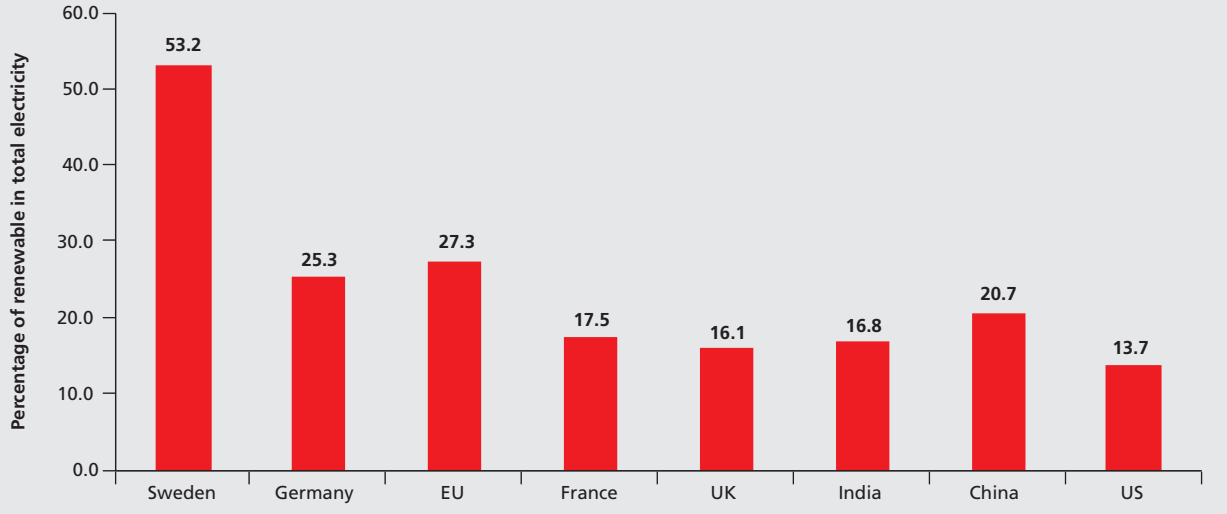
But even favourable economics has not propelled the US to climb the renewable ladder.

The pecking order

The US is lagging far behind other major economies. In EU the share of renewable energy in power generation was 23 per cent in 2013. While Sweden uses 53 per cent of renewables in total electricity generation, Germany and France use 26 and 18 per cent renewables, respectively. In China and India, renewables share in electricity generation is 21 and 17 per cent respectively — significantly higher than the US (see Graph 3.16: *Percentage of renewable electricity in different countries*).

Graph 3.16: Percentage of renewable electricity in different countries

The US is a real laggard in using renewable sources to produce electricity



Source: Enerdata 2013

Not enough capacity

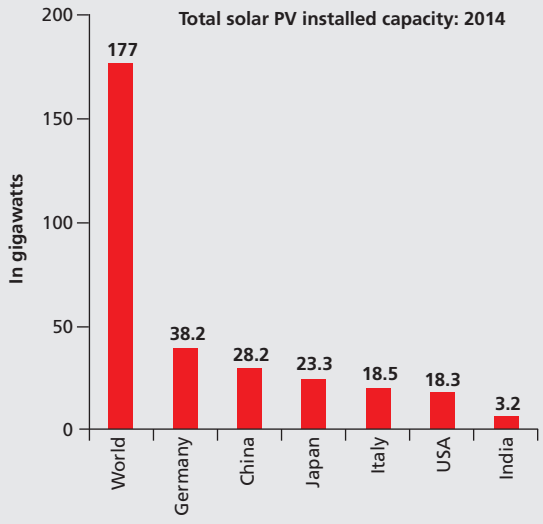
In 2014, the country with the highest wind power installation was China. Germany had the highest solar photovoltaic (PV) installations in 2014. The US ranked 2nd in wind power installation and 5th in solar PV installations. The US renewable power installed capacity is less than half of EU-28 and 50 per cent lower than China's total renewable power capacity (see Graphs 3.17: *Total solar PV installed capacity: 2014*; see Graph 3.18: *Total wind power installed capacity: 2014*; and see Graph 3.19: *Total renewable power installed capacities, excluding hydropower*).

The US is simply not leading the transition towards renewable energy. Its investments in renewable energy has peaked and then plummeted. In 2014, the US invested US $38.3 billion in renewable power and fuels. This was equivalent to 0.2 per cent of its GDP. In comparison, China invested US $83.3 billion, or about 0.75 per cent of its 2014 GDP, on putting up renewable power and fuel installations.[13] India invested US $7.4 billion on renewables in 2014 or about 0.3 per cent of its GDP (see Graph 3.20: *Investments in renewable power and fuels*).

In the last 3 years (2012-2014), the share of the US in total global investments in renewable energy has averaged 15 per cent. China, on the other hand, has accounted for 27.5 per cent of total global investments in renewable energy, 2012-2014. In 2014, while the US accounted for 14 per cent of the global investments in renewable energy, China's contribution was 31 per cent. China, therefore, is bearing the burden of transition to renewable energy. Large-scale investments in China means that the global prices of renewable technologies is coming down allowing other

Graph 3.17: Total solar PV installed capacity: 2014

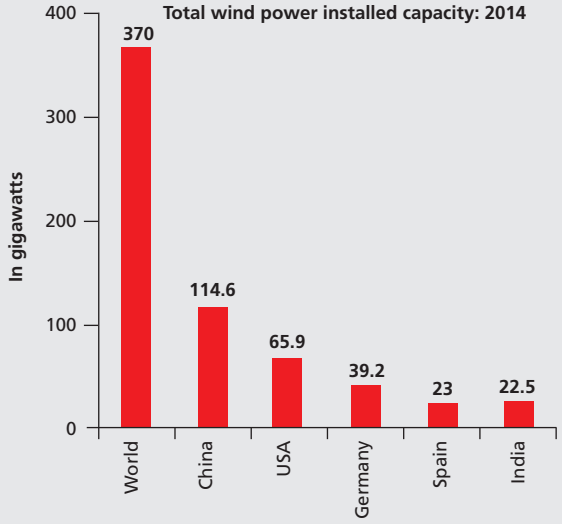
US disinterest in solar is absolute



Source: Renewables 2015 Global Status Report

Graph 3.18: Total wind power installed capacity: 2014

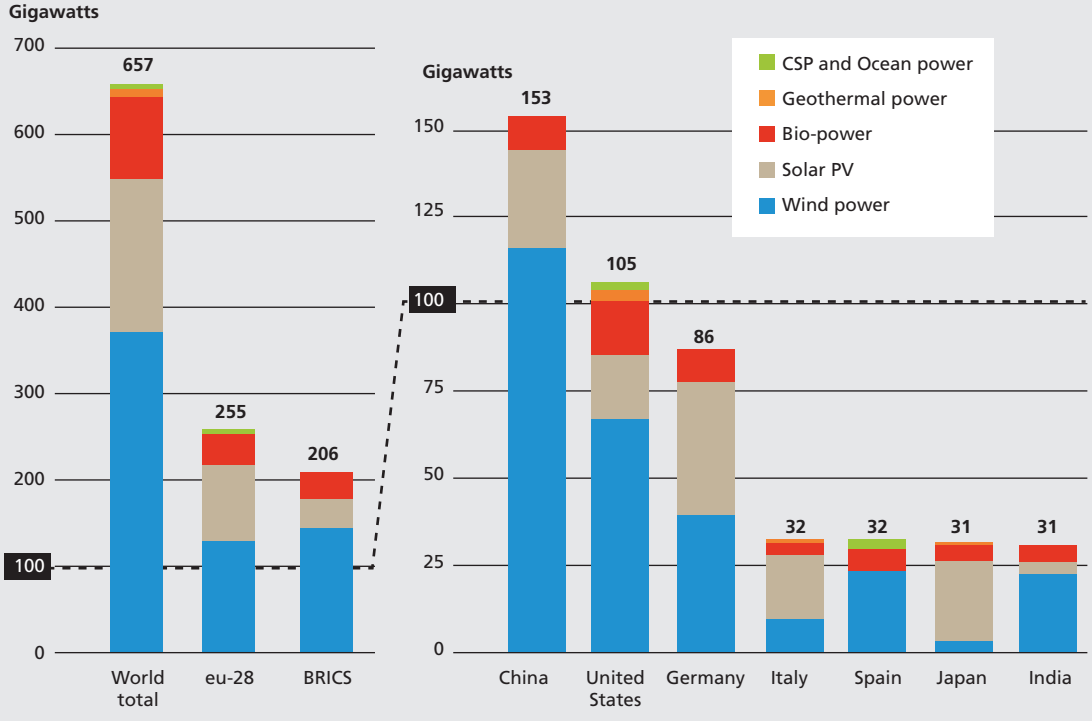
China is far ahead of the US



Source: Renewables 2015 Global Status Report

Graph 3.19: Total renewable power installed capacities, excluding hydropower

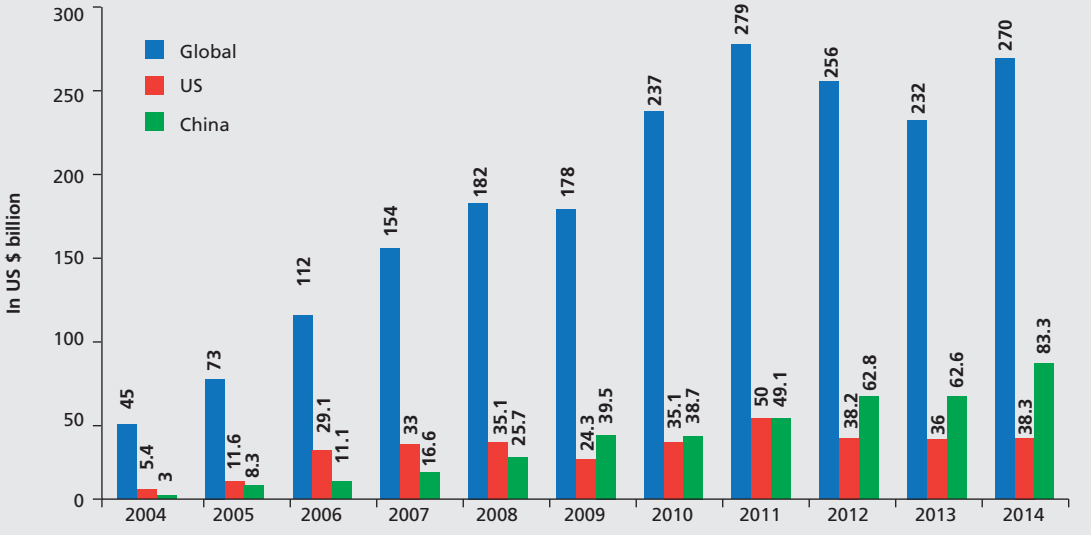
Wind is popular in the US just because it is cheaper



Source: Renewables 2015 Global Status Report

Graph 3.20: Investments in renewable power and fuels

The US has shifted the burden of transition to renewables to other countries



Source: Renewables 2015 Global Status Report

countries, including the US, to benefit from cheap renewables.

The biggest problem is that US is not committing to take up more burden in the future as well.

No commitments

US has plans to install 100 GW of renewable capacity across federally subsidised housing by 2020, permitting 10 GW of renewable projects on public lands by 2020, deploying 3 GW of renewable energy on military installations by 2025, and doubling wind and solar electricity generation in the United States by 2025.[15]

If we assume the US will double its wind and solar electricity generation by 2025 with respect to 2014 (we are over-projecting, as the US has not specified the baseline years), then in 2025 the solar power capacity in the US will be 36.6 GW and wind power capacity will be about 132 GW. For the record, in 2014 the total solar power capacity in Germany was 38.2 GW and total wind power capacity in China was 115 GW. So, even in 2025, US will have lower or similar solar and wind capacity than Germany and China, respectively. This is truly unambitious.

In fact, India and China have more ambitious goals on renewable energy than the US. As part of its Intended Nationally Determined Contribution submitted to the secretariat of the United Nations Framework Convention on Climate Change, China has pledged to install 200 GW of wind power and 100 GW of solar power by 2020.[16] Similarly, India has set itself a goal to install 100 GW solar power and 60 GW wind power capacity by 2022. In 2022, India will have 170 GW of

115

In gigawatts, installed wind energy capacity in China, 2014. Similar to what the US plans to install by 2020

renewable power capacity; the US will reach this level in 2025.[16]

From all angles, we find that the US is doing far less than others in renewables energy. We cannot find any other reason other than price of renewables that can explain the reluctance of the US to deploy more renewable energy. While countries like China and India are putting up expensive renewable energy, the US is refusing to do so because it wants its consumers to have cheap electricity.

Obama on Overdrive

The Clean Power Plan (CPP), a regulation that aims to reduce carbon dioxide emissions from US power plants 32 per cent below their 2005-emissions level by 2030, was formally unveiled on August 3, 2015. The plan exists under the umbrella Clean Air Act; its implementation will be overseen by the Environmental Protection Agency (EPA). Speaking to journalists the day before, White House advisor Brian Deese said the new EPA rules were nothing less than the "biggest step that any single president has made to curb the carbon pollution that is fuelling climate change".

CPP was first announced on June 2, 2014. It faced a lot of heat and, over a year,was revised. EPA released final rules in June 2015. That generated positive buzz. As *The Guardian* reported, Al Gore said the new rules were "the most important step taken to combat the climate crisis in our country's history". At the formal ceremony, President Obama spoke at length. The White House also released a statement in which CPP is linked to the global climate treaty: "Taken together, these measures put the United States on track to achieve the president's near-term target to reduce emissions in the range of 17% below 2005 levels by 2020, and lay a strong foundation to deliver against our long-term target to reduce emissions 26 to 28% below 2005 levels by 2025".

After the august unveiling, the world took up the refrain. "The Plan," said Stéphane Dujarric, spokesperson for UN Secretary-General Ban Ki Moon, "is an example of the visionary leadership necessary to reduce emissions and to tackle climate change". Speaking to reporters in New York on Monday itself, he also said: "We believe that this plan shows the United States' determination to address global warming while also saving money and growing economy". CPP received wide media coverage, and a lot of attention in the social media. Some, such as Greenpeace and 350.org, were skeptical. But, largely, the world accepted CPP was the best the US could come up with and do.

Is that so?

If it is the stated goal of CPP to reduce coal consumption, immediate comparison places a question mark on that ambition:

- The European Commission projects that, in 2030, only about 12 per cent of EU-28 electricity will come from coal. Under CPP, in 2030 coal will be the basis for at least 25 per cent of all electricity the US will

generate. Thus, compared to the EU-28, the US' dependence on coal will remain very high, even in 2030;

- 12 of China's 34 provinces, that account for 44 per cent of China's coal consumption, have pledged to implement coal control measures. The province of Beijing alone plans to cut coal emissions by 50 per cent compared to 2012 levels by 2017. Collectively, China's coal control measures imply lesser coal consumption to the tune of about 350 million MT by 2017 and 655 MT by 2020, compared to business-as-usual growth. In CPP, US coal consumption will reduce by a much lesser amount.

If it is the stated goal of CPP to reduce emissions, then it is worth noting, to begin with, that the so-called reduction of power sector emissions by 32 per cent below 2005 emissions levels is NOT a target. It is a projection. Of what would happen to total emissions from the US' electricity sector if CPP were implemented in an assumed growth, energy price and energy mix scenario. What CPP has done is just lay out a way (or four; see below) for power plants and different states to comply with its projection. If the scenario changes — say, the US' growth rate doubles than the assumed scenario, or oil and gas prices reduce significantly than assumed — the outcome will be different. Thus, this metric — much bandied about in reportage on CPP as a tough 'target' — is misleading.

CPP is misleading for another reason. CPP takes 2005 as the baseline year for emissions reduction (see: Chapter 1, 'Mask 1: the 2005 'peak"). 2005 was a year in which US emissions peaked. Whereas US emissions have fallen but also risen, year-on-year, since then the US has picked and pickled, then promoted and packaged 2005 as its baseline year for emissions reduction, first in the global climate treaty arena, and now in CPP. If 1990 is taken as the baseline year, actual emissions reduction by 2030, a la CPP, are going to be be a paltry 15 per cent. In this respect, CPP is as misleading as all US commitments on tackling climate change are.

CPP: the devil in the details

CPP comprises two key elements:

1. Setting specific CO_2 emission standards — a limit, if you like — for existing coal- and gas-based power plants; and
2. Converting the above standards into state-specific CO_2 goals for the entire electricity sector.

Element 1 is detailed elsewhere (see Box: *Limits or Limitless?*). So let's look at element 2. CPP defines state-specific goals in terms of carbon intensity goals (specific CO_2 emissons per unit of electricity generated in a state). This goal a state must reach by 2030. For each state, EPA has calculated a goal by taking into consideration the CO_2 emissions performance of existing plants in each state and each state's mix of energy sources to produce electricity.

States can also opt for mass-based standards (tonnes of CO_2 a state can

emit from its electricity sector by 2030). Here, EPA has used a method to first estimate how much emissions are allowed in 2012 and then add to it the emissions growth allowable till 2030 due to increase in electricity generation. But, when all emissions are added up and divided by the amount of electricity generated in 2030, the figure must be such that it conforms to a state's carbon intensity goals.

Every state can meet its target how it prefers. Closing old coal plants, increasing natural gas use, adding renewables — or increasing renewables use — in the energy mix, increasing energy efficiency in homes, shops and offices, putting a carbon tax on electricity consumption or emissions from power plants,even working with other states to set-up market-based systems such as cap-and-trade.

In CPP as it now stands, states have to submit plans, latest by 2018, on how they'll comply. EPA will vet and clear their plans. The states must implement approved plans 2022 onwards. Here is a compromise: in the draft CPP, the start-reducing-emissions schedule was tougher.

The draft CPP and the final August 2015 version differ in at least two important ways. Specific CO_2 emission standards for existing plants were absent in the draft rules.Also, implementation dates have been extended by 2 years: in the draft rule, cuts had to begin from 2020, instead of 2022. These changes have been made to facilitate emission trading between states. The net result of these changes, as EPA projects, is a shift from 30 per cent CO_2 reductions in the electricity sector by 2030, over 2005 levels, to 32 per cent.There will also be some increase in renewable energy use.

After the draft CPP was released in June 2014, the Independent Statistics and Analysis wing of the Energy Information Administration — EIA, a body that looks into the implications of legislations on the US energy sector — went through it with a fine toothcomb. We, with a finer toothcomb, go through EIA's analysis of the draft rule. We wish to really understand how exactly will CPP decarbonise the US' electricity sector.

Analysing EIA's analysis

EIA created multiple scenarios to project what CPP could achieve:

- AEO: EIA's reference case scenario for 2015. It is founded on annual projections of energy supply, demand and prices, based on existing regulations and market conditions,up to 2040.
- CPP: It is the base policy case that models CPP's ambitions using energy supply, demand, and prices assumed in the AEO 2015 scenario as the underlying baseline.
- CPPEXT: A Policy Extension case, a hypothetical scenario. It hypothetically extends CO_2 reduction targets beyond 2030, in order to reduce CO_2 emissions from the power sector by 45 per cent below 2005 levels in 2040, using the AEO 2015 reference case as the baseline.
- CPPHEG: Models CPP using the AEO 2015 High Economic Growth trajectory as the baseline. In this scenario, electricity and natural gas demand are higher, as are fuel prices, than the reference case.

Limits or Limitless?

A look at what the US has in store for its power plants

In the Clean Power Plan (CPP), the Environmental Protection Agency (EPA) has fixed emissions standards for existing coal-based power plants at 1,305 lb carbon dioxide per megawatt-hour (CO_2/MWh), or 592 kg CO_2/MWh. Gas-based plants can only emit 771 lb CO_2/MWh, or 350 kg CO_2/MWh. EPA arrived at these numbers after taking into consideration actions a power plant could take to reduce emissions. These actions, called 'building blocks' in CPP, include making fossil fuel power plants more efficient, switching to natural gas and scaling up a plant's share of renewable energy in its electricity production profile. A power plant can employ all these 'bulding blocks' to achieve the emissions standards.

EPA has also notified, separately on August 3, 2015, CO_2 emissions standards for new, modified and reconstructed power plants. For base load gas-based new and reconstructed plants (base load plants are those that run for 24-hrs, on a certain capacity), the standard is 1,000 lb CO_2/ MWh-gross or 454 kg CO_2/ MWh-gross (megawatt hour-gross denotes all the power a plant produces, including what it itself uses). According to the EPA, a natural gas combined cycle (NGCC) technology can meet this norm. For a new coal-based power plant, the emission standard has been fixed at 1400 lb CO_2/ MWh-gross (635 kg CO_2/ MWh-gross). As per EPA's analysis, a new highly efficient supercritical pulverized coal unit with partial carbon capture and storage (about 20 per cent of carbon capture) can meet this standard.

The CO_2 emissions standards for new, modified and reconstructed power plants are shocking. to say the least.

The standards the US has set for new gas-based power plants is hardly better than what the new gas-based power plants are already meeting in the US. In fact, the standards are so poor that all the existing gas-fleet will meet these stanadrds without even changing a screw.The current fleet-wide emission rates of the gas-based plants are 894 lb/MWh, 899 lb/MWh and 951 lb/MWh in the East, West, and Texas (the three main electricity grids), respectively.

The standards for new coal-based based plants are tougher but can be met with emerging technologies. A highly efficient ultra supercritical coal plant using washed high calorific value coal can meet these standards. The implication is frightening: the US is open — amenable, willing, as interested as ever — to setting up more fossil fuel-based power plants within its national boundaries. It is, in fact, encouraging industry to setup inefficient gas-based power plants.

These standards show how hypocritical the US is on the issue of climate change. The US, of late, has put pressure on multilateral banks and financial institutions not to fund coal-based power plant projects in developing countries — Pakistan, Turkey, even Bangladesh, immediately come to mind. But it has kept the option open for itself to set up new coal-based power plants.

- CPPHOGR: The CPPHOGR case models CPP using the AEO 2015 High Oil and Gas Resource trajectory as the baseline. This scenario has lower fossil fuel prices than the reference case.

CPP does not mandate particular energy mix. It projects emissions reductions if all states implement their carbon intensity goals or mass-based targets. Because states have huge flexibility to meet their targets, it is very difficult to predict the mix of energy and the final emissions reduction in 2030 and beyond. Therefore, the need for multiple scenarios.

How much CO_2 emissions will CPP reduce?

EIA analysis shows electricity sector CO_2 emissions in the base policy case will be 25 per cent below 2005 levels by 2020 and 34 per cent below 2005 levels by 2030. In all the modelled scenarios, US power plants will emit at least 22 per cent below 2005 levels by 2020 and 29 per cent below 2005 levels by 2030. The maximum reduction is in the CPPEXT scenario: 26 per cent by 2020 and 36 per cent by 2030, compared to 2005 levels (see Graph 3.21: *Projected CO_2 emissions reduction under scenarios*).

But these numbers hide a lot more than they reveal.

The electricity sector in the US is already emitting 15 per cent less than what it was in 2005. From 2005 to 2014, this sector's emissions reduced 1.8 per cent annually, largely due to a switch from coal use to natural gas use. The switch has not happened because of any altruistic, or climate-caring, reason. It is cold economics: it is cheaper to produce electricity using natural gas than coal.

The cold-economics switch has enabled the US to reduce electricity sector emissions 1.8 per cent annually, in the last 15 years. Now, even if this sector emits, by 2030, 34 per cent less than what it did in 2005, the annual rate of reduction from now till 2030 will only be about 1.6 per cent. In other words, the annual rate of reduction in the future, as imagined in CPP, is going to be less than what has already happened, that too in a business-as-usual scenario. How, therefore, is CPP ambitious? How is it "historical", as President Obama has claimed?

CPP also does not enable a significant reduction in total emissions from the electricity sector. By choosing 2005 as its baseline to cut emissions, the US has concealed the huge emissions increase that happened from 1990 to 2005. If, instead of 2005, 1990 is used as a baseline, the true picture of what CPP enables — actually, glosses over, suppresses — becomes clear.

Compared to 1990 levels, there will hardly be any reductions till 2020 in the US electricity sector, under all projected scenarios. In 1990,this sector emitted 1,865 million MT. What will it emit in 2020? In CPPEXT, the most climate-ambitious scenario EIA has modelled, the least this sector will emit is 1,800 million MT. That's just 4 per cent below what the sector emitted in1990.

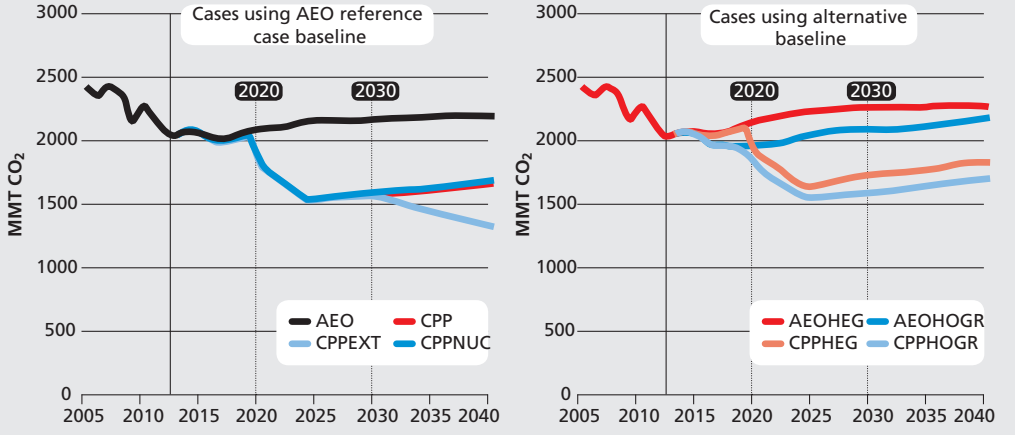
Next question: what happens by 2030? By 2030, this sector will emit at least 1,550 million MT. That is just 17 per cent below 1990 levels! Also, 1,550 million MT is a hell of a lot of CO_2 emissions. It is equivalent to 75 per cent of the *total* CO_2 emissions from India *from all sectors* in 2012. Fathom: just one sector of the US will emit, by 2030, 75 per cent of what 1.2 billion-strong India emitted *in toto* in 2012. Wow. That's the plan?

How important will renewables be in the energy mix?

A good way to tackle perplexity — or attain clarity — regarding CPP is to look at the projected energy mix in 2030: which energy sources are going to be used, or not. EIA modelling shows that if oil and gas prices will be

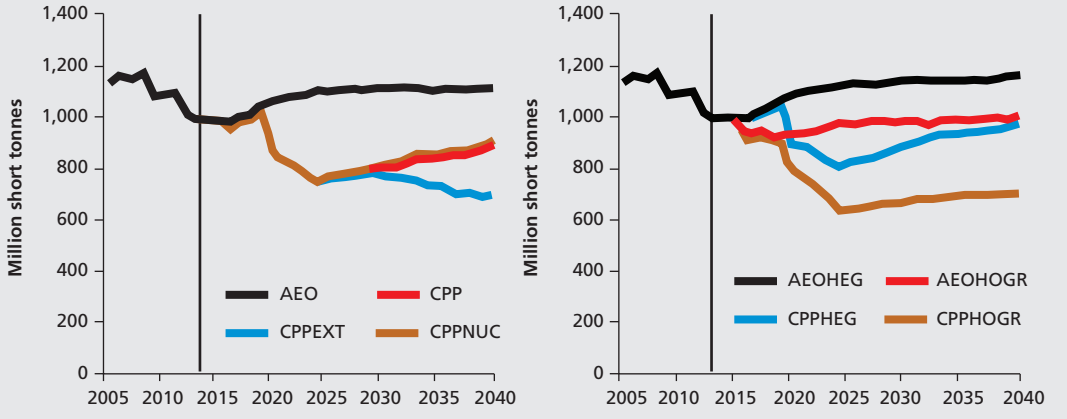
Graph 3.21: Projected CO_2 emissions reduction under scenarios

The Clean Power Plan doesn't do much to reduce emissions



Graph 3.22: Production of fossil fuels in different scenarios

The US energy system is projected to remain heavily dependent on fossil fuels



Note: 1 short ton = 0.907 metric tonne

Source: Analysis of the Impacts of the Clean Power Plan, Independent statistics and analysis, U.S. Energy Information Administration, May 2015

low, the US will meet its CPP targets by using large quantities of natural gas. If expensive, renewables will play a more significant role. But what is clear is that till 2030, most of the emissions reduction will happen due to greater use of natural gas and lesser use of coal. So, the past will continue in the future, too.

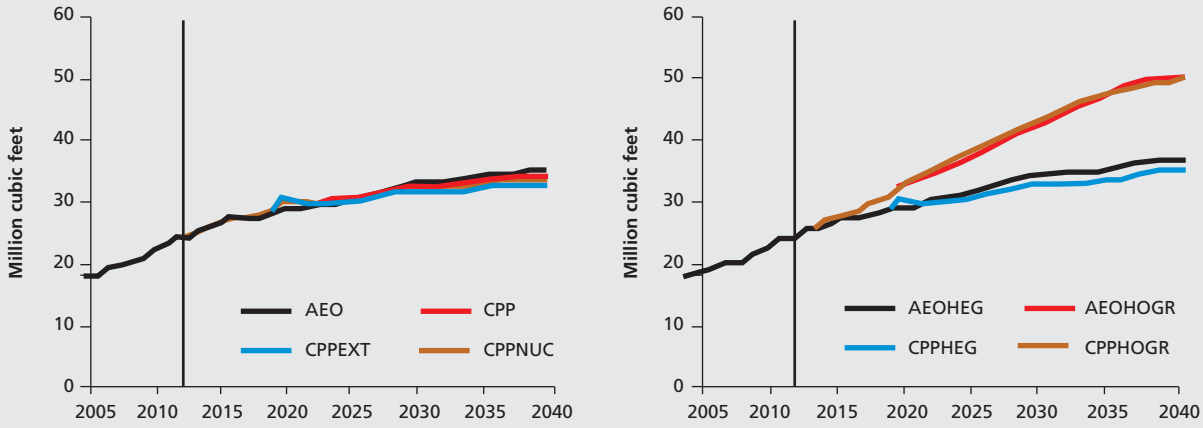
Let's look at the issue of energy mix a little more closely. Fuel by fuel.

King Coal

In the CPP (base policy) scenario, coal production is projected to go down 20 per cent by 2020 and 32 per cent by 2030. This matches projected

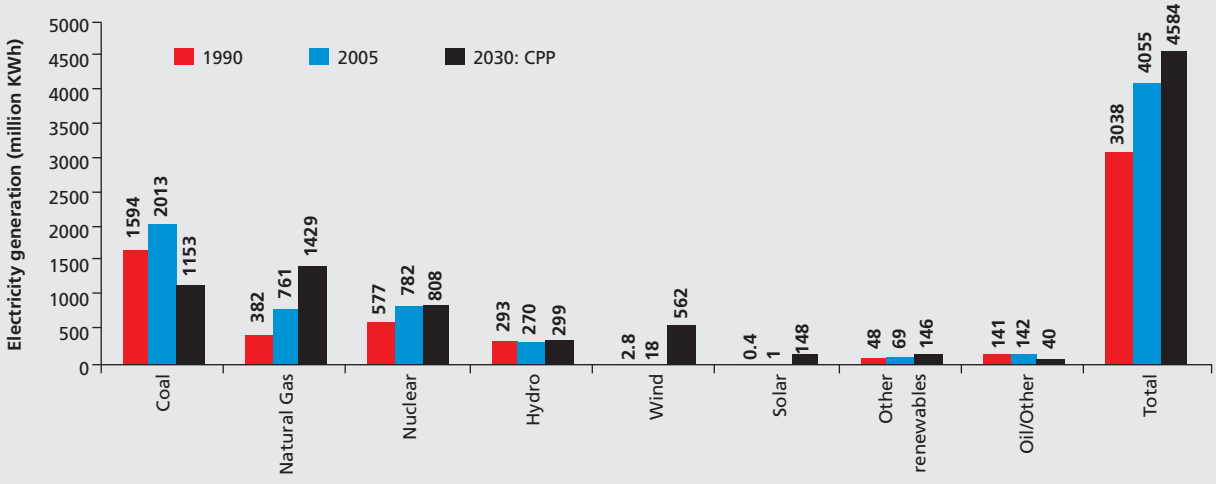
Graph 3.23: Projected natural gas production in different scenarios

It is quite clear that future cleaner climate plans are founded on gas use



Graph 3.24: The future US energy mix

There is no change, from now till then



Source: Analysis of the Impacts of the Clean Power Plan, Independent statistics and analysis, U.S. Energy Information Administration, May 2015

reductions in CO_2 emissions. Coal production reduces further in the CPPHOGR scenario: here, gas is highly available and prices are low. In the CPPHOGR scenario, coal production can reduce by 40 per cent by 2030. However, in all scenarios — and this is the point to consider — the least amount of coal the US will produce in 2030 is still going to be around 600 million MT. That's really high: equivalent to what India consumes today. In fact, in the CPP scenario, coal production in 2030 will be about 725 million MT (see Graph 3.22: *Production of fossil fuels in different scenarios*). Where's the backing-off?

Prince Gas

In all scenarios, natural gas production continues to increase till 2030 and beyond. In fact, in all scenarios, natural gas production exceeds 32 trillion cubic feet — about 75 per cent higher than 2005 levels. Indeed, in the CPPHOGR scenario, production could more than double, compared to 2005 levels (see Graph 3.23: *Projected natural gas production in different scenarios*). Is this a mitigation option, nationally and internationally (any gas emitted has an 'international/ global-atmospheric dimension')? No, for such levels of accepted production, policy-driven, means the US is just not going to interfere in the way people consume electricity. The switch to gas is really a bogey. Cost rules, not climate change action.

The Orphan

Even in 2030, all the electricity produced from all renewables (excluding hydropower) in the US will still be 25 per cent less than that produced from coal. If hydropower is included, total electricity produced from all renewables is going to be the same as that produced using coal. In 2030, electricity produced from all renewables and coal will be about 25 per cent, each. Gas and nuclear will account for the remaining 50 per cent (see Graph 3.24: *The future US energy mix*).

Essentially, even by 2030 under President Obama's CPP, fossil fuels will be used to produce — will continue to produce — 57-60 per cent of all electricity. In 2014, fossil fuels accounted for 67 per cent of all electricity produced. In 2030, solar power will contribute just 3 per cent to total electricity produced. Wind? 12 per cent, only. So, popular renewables such as wind and solar will remain marginal, in the US, in 2030.

Brute Fact

Brute fact is that, even in 2030, the energy system in the US is hardly going to change, under CPP. The system remains fossil-fuel heavy (see Table 3.2: *How decarbonised is the US energy system in 2030*):

- Energy production and consumption continues unabated. In 2030, the US will produce 22 per cent more primary energy than 2013 levels.
- The energy system in the US remains fossil-fuel dependent. In 2013, 78 per cent of total primary energy the US produced came from fossil fuels. In 2030? 76 per cent will come from fossil fuels. Indeed, in 2030, total fossil fuel production in the US will be 20 per cent higher than in 2013.
- Renewables will remain marginal. In 2013, renewables contributed 11 per cent to total primary energy produced in the US. In 2030, this alternative will increase, marginally, to 15 per cent.

What's really going to happen? Let's read it from pp 16-17 of the 1,560-page CPP final rule document itself: "Coal and gas will remain the two leading sources of electricity generation in the US, with coal providing

Table 3.2: How decarbonised the US energy system is in 2030

Not much at all

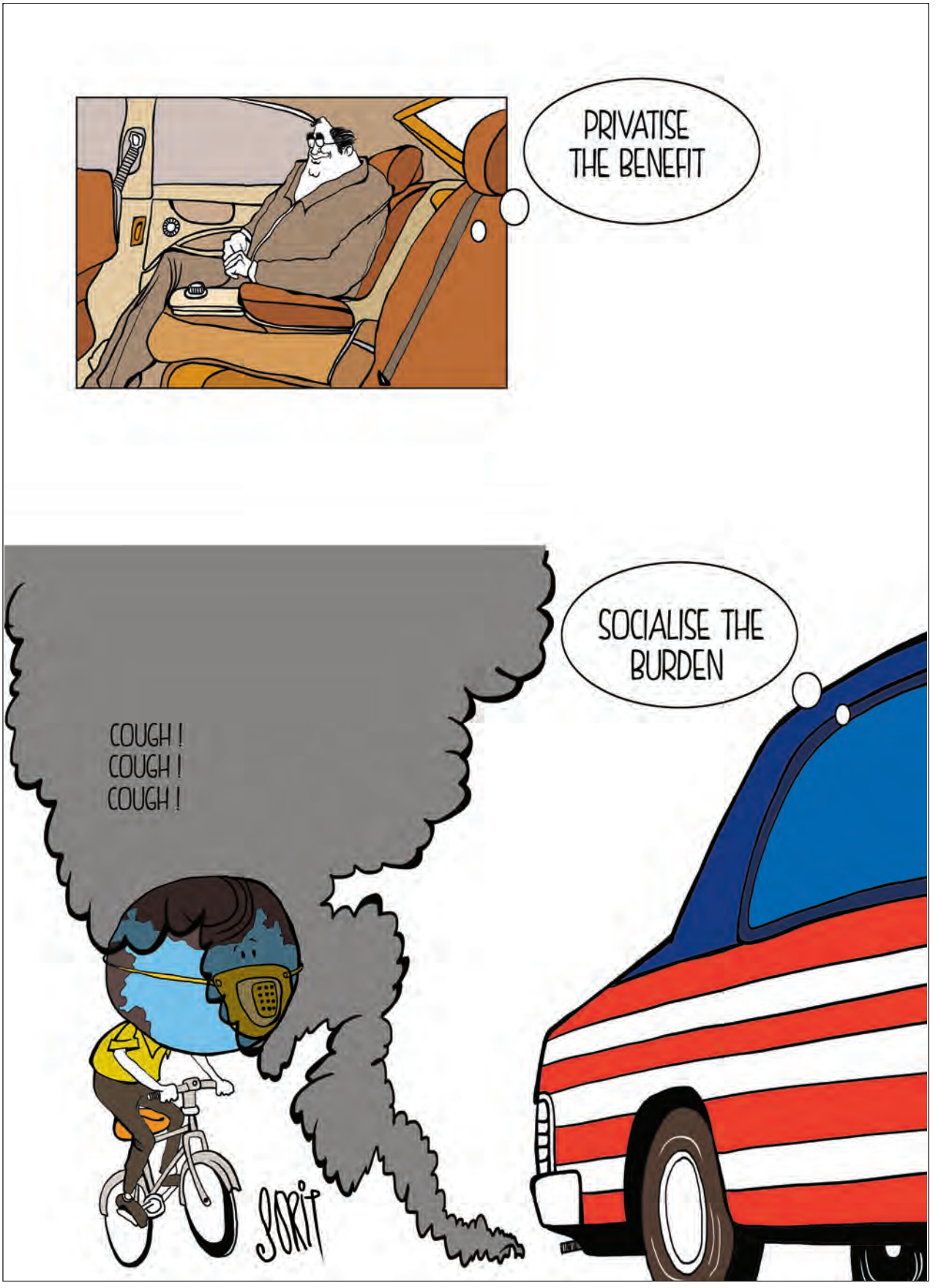
	Primary energy production in 2013 (in quadrillion Btu)	Clean power plan scenario: 2030		
		Primary energy production (in quadrillion Btu)	Percentage increase over 2013 (%)	Percentage of the total (%)
Natural Gas	25.1	33.6	34	33
Coal	20	16.6	-17	16
Oil	19.2	26.8	40	26
Nuclear	8.3	8.5	2	8
Renewable	9	14.8	64	15
Other	1.3	0.9	-31	1
Total	**82.7**	**101.2**	**22**	**100**

Source: Analysis by CSE using data from: Analysis of the Impacts of the Clean Power Plan, Independent statistics and analysis, U.S. Energy Information Administration, May 2015

about 27 percent of the projected generation, and gas providing about 33 percent of the projected generation".

All in all, CPP hardly transforms the energy system. How is this plan — the first-ever climate action step the US has taken — the most ambitious the US has ever imagined? Has the US run out of imagination? For a country that has been most unimagimative, or utterly practical, about climate change — despite its high level of development, its Human Development Index of 0.94; by almost any index of human prosperity or well-being, it is right up there at the top — is CPP another proof it has run away from ambition? Again?

Most sadly, has the world lost its capacity to critique and challenge the US?


PRIVATISE THE BENEFIT
SOCIALISE THE BURDEN
COUGH !
COUGH !
COUGH !
SORIT

- **Transport sector in 2013 was responsible for 28 per cent of all US emissions; within this passenger cars contributed some 42 per cent; light duty trucks, which includes SUVs, 18 per cent and then trucks another 23 per cent. Private vehicles resulted in 60 per cent of the country's emissions.**

- **Buses, railways — most efficient transport — contributed less than 5 per cent; air travel emissions were more than railways.**

- **After 2005, emissions have reduced annually by 1.4 per cent — a marginal decline at best. But even here emissions from passenger cars are growing by 1 per cent each year.**

- **Some 86 per cent Americans commute using the car, as compared to 10-15 per cent in India. This is not changing.**

- **The rest of the world is realising that reining in transport related emissions requires reinventing mobility so that people move, not cars. US, it seems, is in reverse gear.**

4. Loco Motion

The US love affair with cars needs to change

The US government says it has adopted the toughest-ever fuel economy standards for passenger vehicles in US history. It is confident its policy prescriptions will reduce emissions from this sector. Is that possible?

In the US, as in other parts of the world, the transport sector is huge and ever growing. From 1990 to 2013 transport emissions increased by 16 per cent and by 2013 this sector was responsible for 28 per cent of all US emissions.[1] There is no evidence to suggest, in all the measures the US has taken, that it plans to transform the way people transport themselves, and so reduce emissions. Forget, for the time being, the scale it needs to reduce by. USEPA data shows that in this sector it is passenger cars — what people drive — that matter most (see Table 4.1: *Emissions from vehicles*). Roughly 42 per cent of emissions from transport are from gasoline- and diesel-run passenger cars. Light duty trucks, including pickups that transport goods and people, add a further 18 per cent. In short, 60 per cent of transport sector emissions are from private modes of transport. Another 23 per cent comes from trucks, medium and heavy duty, which transport goods across the vast country. The most efficient and low-carbon modes of travel, railways or bus, contribute less than 5 per cent of emissions. Emissions from air travel are more than that from railways. It is a scenario that isn't changing.

Table 4.1: Emissions from vehicles ($MMTCO_2e$)

The most efficient and low-carbon modes of travel, railways or bus, contribute less than 5 per cent of emissions

Vehicle type	1990	2005	2009	2010	2011	2012	2013	Annual change between 2005-2013	% of contribution to total emissions
Cars	656.7	711.2	792.9	783.6	774.3	768	763.3	0.89	42
Light duty trucks	335.6	553.3	351.6	349	332.1	326.2	323.4	-6.49	18
Medium and heavy trucks	231.1	409.8	389.6	403	401.3	401.4	407.7	-0.60	23
Bus	8.4	12.1	16.2	15.9	16.9	18	18.3	5.31	1
Rail	39	53.3	43.7	46.5	48.1	46.8	47.5	-1.43	3
Others*	94.5	89.3	88.3	95.3	97.1	93.2	100.1	1.44	6
Aviation	189.2	193.5	157.4	154.7	149.8	146.4	150.1	-3.12	8
Total	**1554.5**	**2022.5**	**1839.7**	**1848**	**1819.6**	**1800**	**1810.4**	**-1.4**	**100**

*Others includes motorcycles, pipelines, lubricants, ships and other boats.

Source: EPA 2014, US Greenhouse Gas Inventory Report 1990-2013, http://www3.epa.gov/ climatechange/ghgemissions/usinventoryreport.html, as viewed on September 1, 2015

42%

Contribution of gasoline- and diesel-driven cars to transport sector emissions

First, cars are not reducing

Compared to 1990 levels, emissions from the transport sector are up 25.5 per cent. Emissions declined after 2005, the year US emissions peaked, but marginally, at best. It cannot be said that the US, till date, has bent its emission curve on transport. Emissions from transport reduced by 1.4 per cent per year between 2005-2013.

But emissions from passenger cars are not reducing. This segment continues to grow at 1 per cent each year in this period. It is also projected that car sales are on the upswing and will break new records in the coming years.

The bus segment, growth in which signals the country is beginning to leap forward on mobility transition (if not transformation), has increased its emissions. But the segment itself has a low base, constituting just 1 per cent of all US transportation emissions.

Emissions from the railways segment — the big opportunity to move passengers and goods with low emissions — has declined, reducing 1.4 per cent each year between 2005-2013. This segment has either become much less polluting in terms of kilometres travelled or its use in the economy is down, not up.

US plans on fuel efficiency standards

The silver bullet for the US in this sector is the improvement notified in fuel-economy standards of passenger (light duty) vehicles. The government expects these standards — applicable in two phases, first to vehicles manufactured between 2012 and 2016 and then to those manufactured between 2017 and 2025 — would substantially tighten the amount of fuel a vehicle can use for each kilometer travelled, and so reduce emissions. The EPA has calculated that light duty vehicle standards are projected to result in an average industry fleet-wide level of 163 grams CO_2/mile (gCO_2/mile) travelled in model year 2025.[2] The Corporate Average Fuel Economy (or CAFÉ) standards, as these are known, are in terms of grams of CO_2, which will be emitted per mile the vehicle travels and are set for a given fleet of vehicles in a given model year. According to International Council for Clean Transportation (ICCT), this would mean that the average light duty vehicle CO_2 emissions would be reduced from the 2016 level of 250 gCO_2/mile to 163 gCO_2/mile for model year 2025. If this standard is converted to km to compare with European standards, then it would mean that US would reduce from 172 gCO_2/km in 2016 to 107 gCO_2/km in 2021. And if only passenger cars are considered then these would come down to 91 gCO_2/km in 2025. Again according to ICCT, with the US light duty standards in place, fuel economy will increase from 34.1 miles per gallon in 2016 to 49.6 miles per gallon in 2025 — a hike of 45 per cent.[3]

In addition to light duty vehicle standards, on June 19, 2015 EPA has issued a draft standard for heavy-duty vehicles — trailers and trucks — which once notified would be implemented over model years 2018 to

2027. These are important as trucks continue to transport bulk of freight in the country and contribute some 23 per cent of the sector's carbon emissions. It is also a fact that the world is only just beginning to move to set fuel economy norms. Only Canada, China and Japan have standards for heavy-duty vehicles. The US standards, says ICCT, establish relatively modest efficiency improvement of 11-14 per cent.[4] Japan and China will implement their standards by 2015 and US and Canada by 2018.

Will fuel efficiency be a game changer?

The question is: will fuel-efficiency standards result in the gains the US government expects?

First, it is well known fuel efficiency standards are difficult to implement on the road. A 2011 report by the Boston-based Union of Concerned Scientists (UCS)[5] found that the mileage standard of 54.5 mpg in the showroom could mean as little as 35 mpg on the road, largely because of the test cycle used to certify compliance with standards. ICCT found similar results in Europe. A 2012 ICCT study found that the gap between type-approval and 'real-world' fuel consumption CO_2 values increased from 8 per cent in 2001 models to 21 per cent in 2011, more efficient, models.[6] A later study by ICCT found that, in 2013, the gap between vehicle emissions testing in laboratory conditions and the real world was as high as 38 per cent. "This gap represents the lower real CO_2 emission benefits with the regulation and higher fuel costs for buyer" writes Drew Kodjak of ICCT.[7]

Second, the US is neither the first to announce fuel efficiency standards nor is it the leader in this field. An analysis by the ICCT compares targets of various countries, their historical performance and proposed targets. Japan and Europe, the analysis finds, continue to lead the world with the most stringent passenger vehicle greenhouse gas and fuel economy standards (see Graph 4.1: *Comparison of light-duty vehicle efficiency standards*).[8] Such findings provoke a question: when Europe and Japan, with their stringent fuel-economy standards, have not been able to rein-in transport sector emissions, will the US be able to do so?

In this context, it is worth looking at a fact the 2011 UCS report comes up with: some five years before the CAFÉ standards kicked in, manufacturers already had cars on the road that could meet them.

Further, critics suggest CAFÉ is limited. The standards have no effect on the current fleet, and so will have no impact on vehicle fuel use for at least another decade. CAFÉ does not reduce levels of driving; indeed, it actually encourages driving. As people get more efficient cars, they drive more. This is called the rebound effect, the absolute bull in an efficiency standard's china shop. CAFE is sure to get gored.

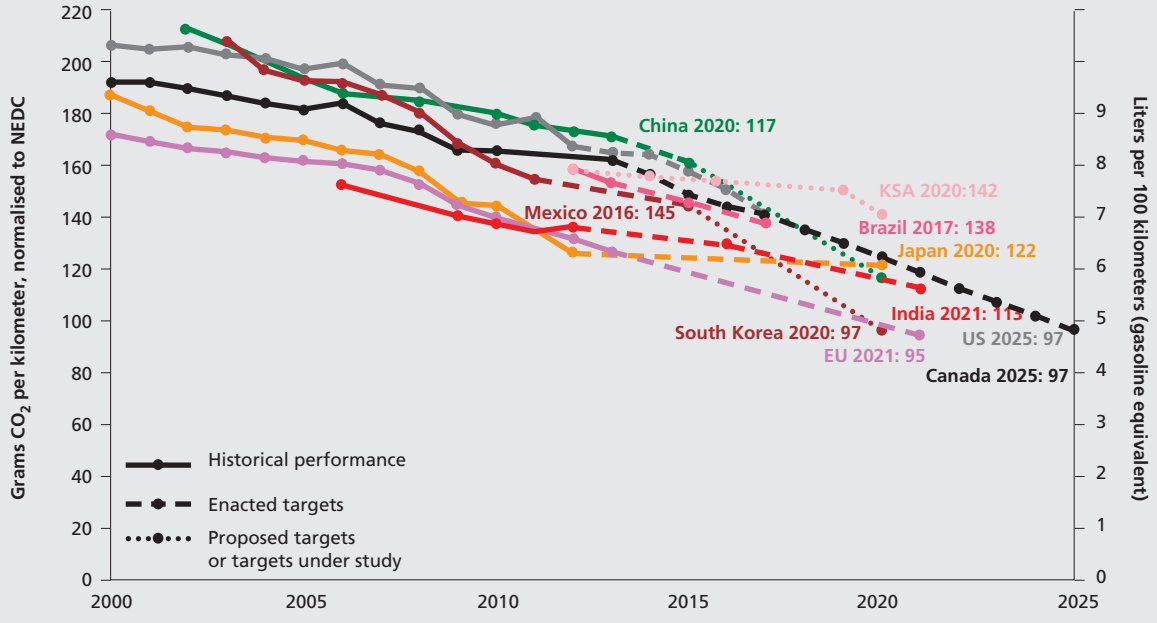
The Centre for Science and Environment's analysis shows that, in the US, increased driving negates about 50 per cent of the fuel savings benefits of fuel efficiency improvements (see Box: *Fuel efficiency is not sufficient*). Even as fuel efficiency in the US increased by 16 per cent

16.9

Cars sold in the US in 2015, in million

Graph 4.1: Comparison of light-duty vehicle efficiency standards

Japan and EU lead the world with the most stringent standards



Source: Drew Kodjak 2015, *Policies to reduce fuel consumption, air pollution and carbon emissions from vehicles in G20 nations*, ICCT briefing paper, May

between 1990 and 2013, miles travelled by vehicles increased 7 per cent. Efficiency gains vapourised.

There is no reason to believe this trend will not continue in the years to come. After a recession-caused increase led to a dip in vehicle miles travelled in 2007, there is an upward swing again. IHS Automotive, a market consultancy, in its annual global survey has projected that in 2015, 16.9 million cars will be sold in the US and this will increase to 17.2 million in 2016 and 17.5 million cars in 2017. If this happens, it would herald a new car-sale peak for the US — the last car-peak was in 2000 when 17.4 million cars were sold.[9] If this happens then it is clear that bulk of the gains made by increasing fuel efficiency and so, reduced emissions of each vehicle, would be lost.

This is also when, according to US Energy Information Administration, motor gasoline use has been rising after the recession-caused dip in 2012.[10] So, car sales are increasing, fuel use is increasing, vehicle-miles are increasing. Bad news for climate mitigation plans.

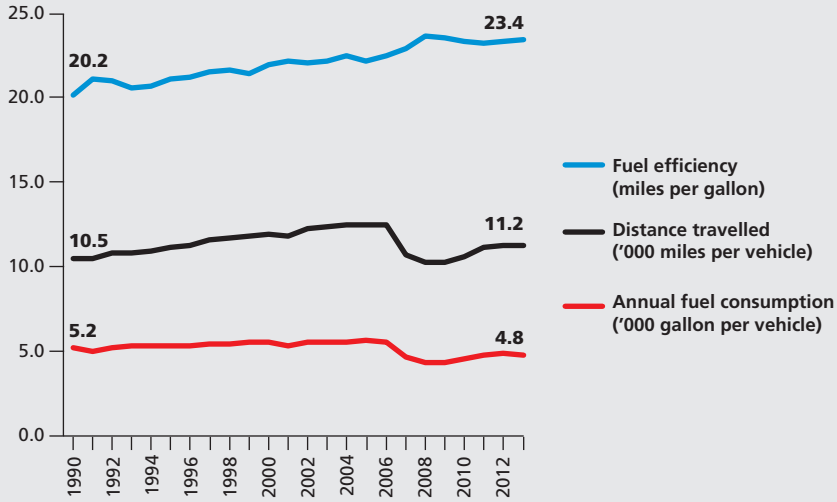
In this way, it is clear that EPA has over-estimated the CO_2 emissions reduction benefit from its silver-bullet measure. Something may happen, but it is likely CAFE will not enable the huge benefits anticipated.

It is just not enough to depend on improved efficiency as a way to reduce emissions, without addressing two key issues: vehicle numbers (private cars as well as goods trucks) and an attempt to change driving modes (consumption patterns).

Fuel efficiency is not sufficient

In the US, fuel efficiency has best improved in the passenger car segment (technically called the Light Duty Vehicle or Short Wheelbase segment). In 1990, the segment's fuel efficiency was 20.2 miles/gallon; in 2013, 23.4 miles/gallon, improving overall by 16 per cent. However, over this period, miles travelled also increased by about 7 per cent: from 10,500 miles per year in 1990 to 11,250 miles per year in 2013. The end effect of this combination is that the average annual fuel consumption per passenger car has reduced by only 7.7 per cent. If the distance travelled had remained constant, the fuel annually consumed by passenger cars would have reduced by 15.8 per cent, instead of 7.7 per cent. In other words, the increase in distance travelled has significantly undercut fuel efficiency advantage, by more than 50 per cent.

Improving fuel efficiency + driving more = little change in total fuel

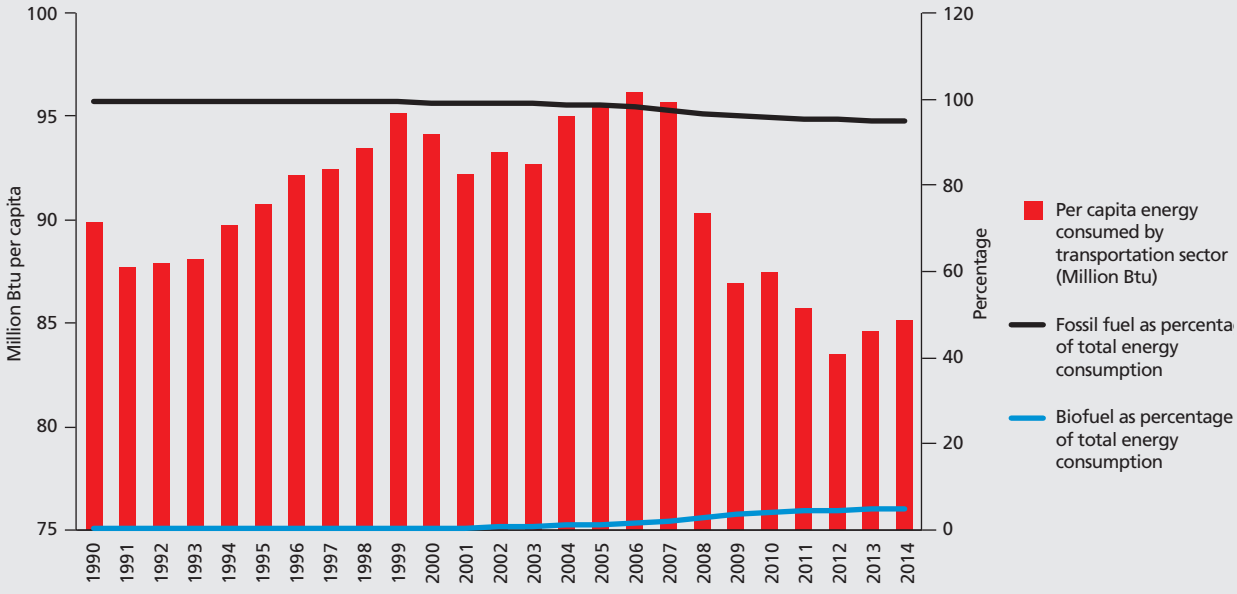


Source: Analysis by the Centre for Science and Environment based on Energy Information Administration dataset, July 2015, Monthly Energy Review

Sufficiency not just efficiency

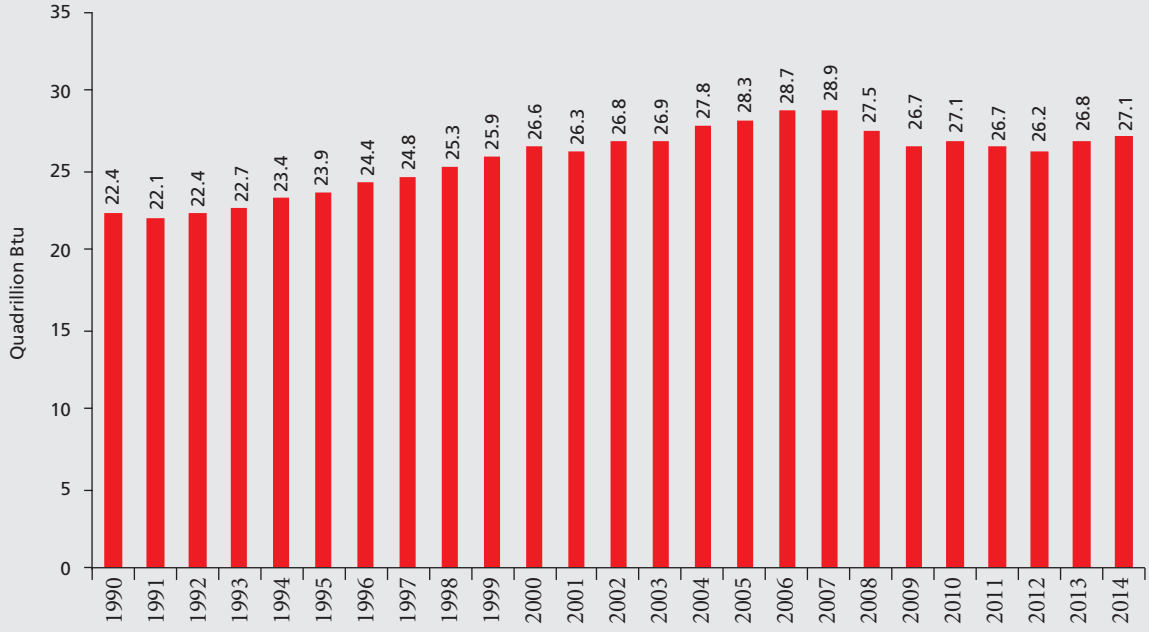
The US has a major problem in the transport sector. The total energy the sector consumes continues to increase. Then almost all the energy consumed is fossil fuel (see Graphs 4.2: *Per capita energy consumption and contribution of fossils and biofuels* and 4.3: *Total energy consumption by transport sector*). Almost its entire population commutes by private cars, and even though ownership is high, more cars are being sold and driven. Then trucks transport most goods. This is also increasing as consumers are buying goods online and companies are promoting same-day delivery. All this means that trucks, used to deliver door to door, have easier logistics for planning and becoming even more important in the freight business.

Graph 4.2: Per capita energy consumption and contribution of fossils and biofuels



Source: Analysis by the Centre for Science and Environment based on Energy Information Administration dataset

Graph 4.3: Total energy consumption by transport sector



Source: Analysis by the Centre for Science and Environment based on Energy Information Administration dataset

The total energy the sector consumes continues to increase, and most of it is fossil fuel. Almost the entire population of the US commutes by private cars, and even though ownership is high, more cars are being sold and driven. Trucks transport most goods. This is also increasing as consumers are buying goods online and companies are promoting same-day delivery.

There is also the matter of how many cars people own — where the divide is, really, between the developed and not-developed world. By 2011, 78 per cent Americans owned a vehicle, as compared to 1.8 per cent in India (see Table 4.2: *Car ownership*). This is not going down, despite recession or concerns for climate change. In 2014, nearly one million more vehicles were sold, as compared to 2013. These 16.5 million vehicle sale of 2014 is expected to break new records in the coming years. Automobile analysts say that there are a host of reasons for this growth: a rebounding economy, increasing consumer confidence, falling gas prices and easier finance.[11]

Table 4.2: Car ownership

78 per cent Americans own a vehicle

Country	Motor vehicles per 1000 people, (year 2011)
United States	786
Japan	588
Germany	588
China	69
Nigeria	31
India	18
Congo (Dem Rep)	5
Bangladesh	3

Source: World Bank, data.worldbank.org/indicators, as viewed on September 1, 2015

Public transport in cities: neglected in the US

In countries like India, large numbers of people use public transport — over 50 per cent on an average. They use this mode of transport because they are poor. The challenge here is to ensure that this often dilapidated, inconvenient and unsafe mode of transport is refurbished and made modern so that even as people get richer, they continue to use it. In India's case, public transport is marginalised, but not replaced.

In rich countries the car replaced public transport as the mode of travel. But now, increasingly and largely driven by local air pollution, climate change and health concerns, there is a shift back towards public transport. This has been done by deliberate policy measures and action. In countries, which compete with the US in terms of vehicle ownership, the track record of using public transport is better. This does mean that rich countries can buy cars (indeed love their cars) and still take a bus, a subway or a bicycle to work.

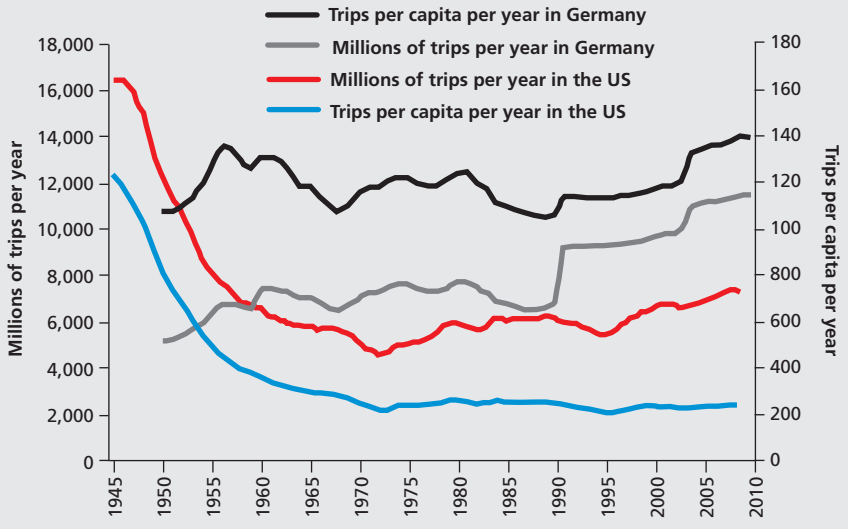
For instance, in Germany, a country also fascinated by automobiles and autobahns, government policies to simultaneously promote public transport and restrain cars through parking price and other measures have led to a change in the way people drive. A 2012 paper by US academics Ralph Buehler and John Pucher makes a fascinating assessment of differences between Germany and US riding styles and how these have changed, or not, through the years.[12]

The paper finds Germans are five times more likely than Americans to make a trip using public transport. Importantly, this trend is growing. Between 1945 and 2010, millions of trips per year by public transport and in terms of per capita are on the increase. But in the US, it is the reverse. While public transport trips per year are increasing very slowly, per capita trips are declining. This is clearly worrying (see Graph 4.4: *Public transport trips — Germany and USA*).

Indeed, Germany is not the best among European nations in terms of public transport. Switzerland is. Comparison makes the US a complete

Graph 4.4: Public transport trips — Germany and USA

Germans five times more likely to use public transport

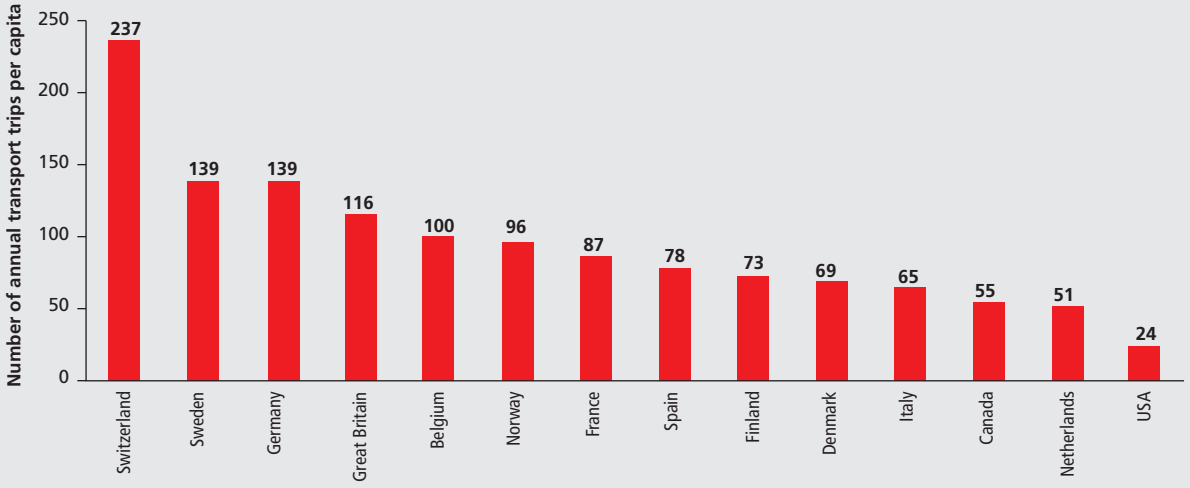


Source: Ralph Buehler and John Pucher 2012, Demand for Public Transport in Germany and the USA: An Analysis of Rider Characteristics, Transport Review, School of Public International Affairs, Virginia Tech, Alexandria, VA, USA; available at http://nhts.ornl.gov/2009/pub/DemandForPublicTransport.pdf, as viewed on September 1, 2015

laggard (see Graph 4.5: *Annual transport trips per capita*). In the US, only 23 trips per capita are made annually on public transport; in Switzerland — with its bus, tram, rail and cycle network — 237 trips per capita per year. Against the global average of only 18 per cent people who never use public transport, in the US the number is a staggering 56 per cent.[13]

Graph 4.5: Annual transport trips per capita

56 per cent people in the US never use public transport



Source: Ralph Buehler and John Pucher 2012, Demand for Public Transport in Germany and the USA: An Analysis of Rider Characteristics, Transport Review, School of Public International Affairs, Virginia Tech, Alexandria, VA, USA; available at http://nhts.ornl.gov/2009/pub/DemandForPublicTransport.pdf, as viewed on September 1, 2015

Railways not part of US climate plans

In 2014, UIC, the International Railway Association, gave itself a transport sector challenge: to grow but reduce greenhouse gas emissions. It has set a goal to reduce, by 50 per cent below 1990 levels by 2030, its energy consumption and CO_2 emissions from trains. The goal is ambitious, for UIC wants to also increase the share of railways in passenger transport by 50 per cent over 2010 levels by 2030, and wants to equalise its share with freight road transport by 2030.

The EU, in its 2011 transport white paper, has set a goal that by 2050, 50 per cent of its freight will be transported by rail or water for distances longer than 300 km. It also proposes to triple the length of its existing high-speed rail network and wants all medium distance passenger transport to be only on rail by 2030. In the US, the share of railways in moving passengers remains at 1 per cent and moving freight at 11 per cent. China, carries 25 per cent of the world's rail freight tonnes/km. India carries 33 per cent of the world's passenger traffic by railways. Most crucially, the US government has not included railways in its climate change plans.

Americans are not fond of trains

Although the US has the largest rail network in the world, railroads accounted for just 17.2 billion passenger-kilometres in 2010. In contrast, in the EU, railways accounted for nearly 400 billion passenger-kilometres in 2010 — 23 times more than in the US. This disparity worsens when one looks at per capita figures. The Japanese, Swiss, French, Danes, Russians, Austrians, Ukrainians, Belarussians and Belgians accounted for 1,000 passenger-kilometres by rail in 2011. In comparison, Americans accounted for merely 80 passenger-kilometres. Amtrak, the US government backed rail company, carried 31 million passengers in 2011; Mozambique's railways carried 108 million passengers and Indian railways moved some 7.7 billion people that year.[14]

The global community is clear that low-carbon growth also means moving towards railways. At the 2014 UN climate summit, the international railway association (see Box: *Railways not part of US climate plans*) committed to make railways less polluting and increase its share in the world's goods and passenger travel. The EU has set a goal; China and India already have high usage. Will the US get this message?

But they do like to fly

According to World Bank data, Americans made 743 million air passenger trips in 2013, which was up to 762 million in 2014. For, India this figure was a paltry 82 million in 2014. The domestic aviation industry in the US is highly competitive, offering attractive options and cheaper fares.[15]

In 2013, aviation was responsible for 8 per cent of US transport emissions — more than bus or railway. Between 2005-2013, aviation-related emissions reduced by 3 per cent each year, a change not policy-driven. By 2013, as the economy revved up, emissions kept creeping up.

23%

Contribution to sectoral emissions from goods transport by road in 2013

Transporting goods

In 2013, goods transport by road contributed 23 per cent of the sector's emissions, railways contributed only 3 per cent (including passenger travel) of the sector's GHG emissions. The goods transport scenario is both ridiculous and positive. A needless reliance on road (and, by extension, heavy vehicles) points to complete inefficiency in the way goods transport is managed; at the same time, the amazing emissions profile of the railways shows an opportunity crying to be availed of. The railway, however, is not part of the US plans for climate action.

Road vs rail

What are the options of moving 18.5 billion tonnes of freight, moved in the US in 2007? So asks a 2013 study of the US department of energy (DOE), in its Transportation Energy Futures Series.[17] The freight business is measured in terms of the total tonnes of goods carried, how many miles these tonnes are carried and what is the value of the goods transported. In the US, 18.5 billion tonnes were generated, requiring 5.4 trillion tonne miles. The value of these goods was US $16.7 trillion. Trucks transported 72 per cent of all this freight, accounting for 42 per cent of tonne miles and 70 per cent of freight value. Rail accounted for only 11 per cent of tonnage moved, but 28 per cent of all tonne miles and 3.5 per cent of total value. The rest was made up by air and waterways.

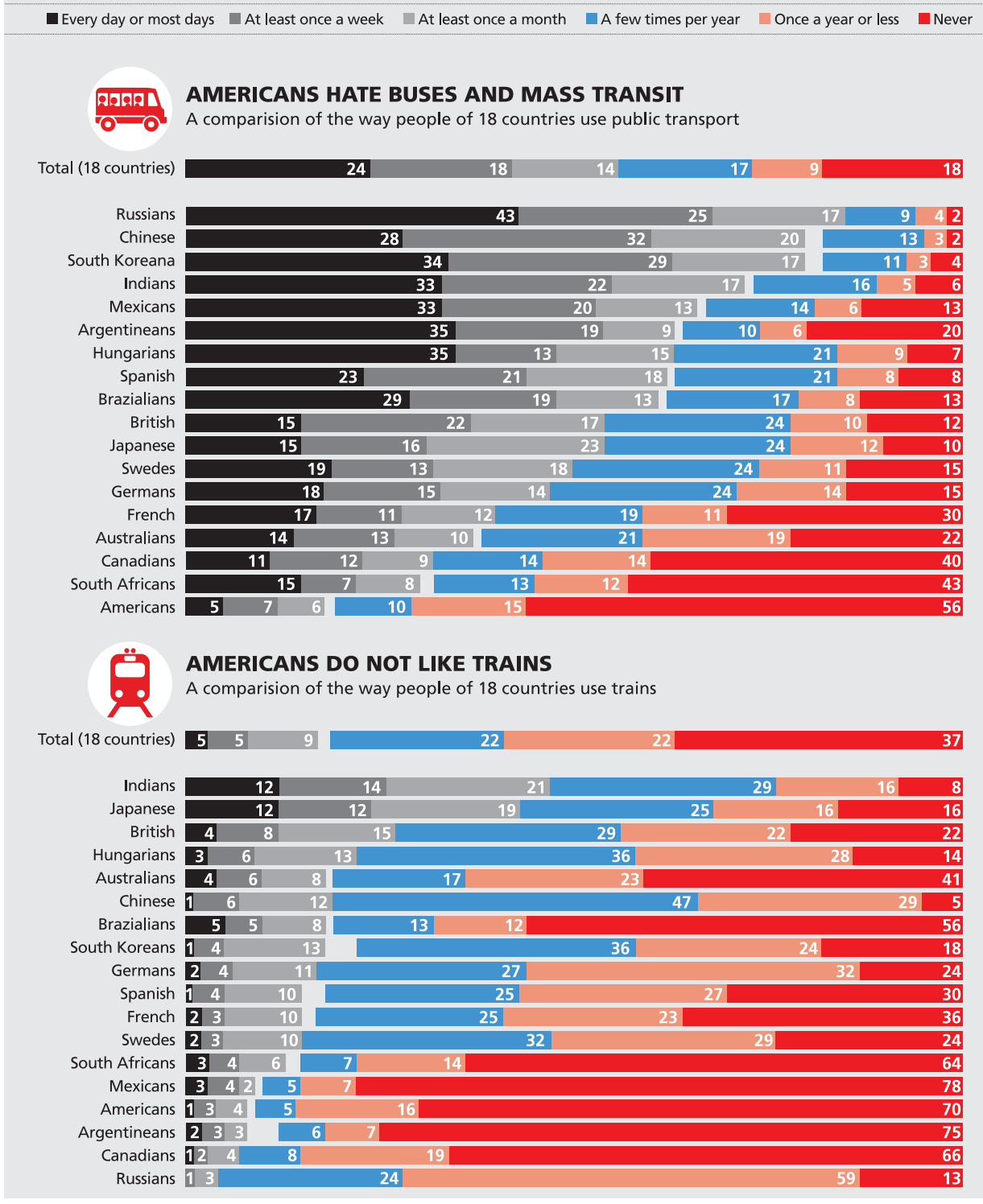
In other words, railway was used to transport heavier, low-value commodities such as coal and grain over long distances. Trucks dominate the market for shipments under 550 miles, which account for almost 80 per cent of all domestic freight tonnage.

Energy used in these modes makes a crucial difference in climate change. Energy used per tonne-mile of freight measured in British Thermal Unit (Btu) is 30 for air, 4 for road trucking, 0.5 for water and 0.4 for railways. Moving from truck to rail would bring down energy used and reduce emissions — this is a no-brainer. The question is: how can this be done? The DOE report recommends the following policies:

One, increase fuel tax. A diesel fuel tax will increase the cost of trucking relative to rail. But given the huge advantage of cheap fuel, the authors of this report conclude that even a doubling of diesel prices would only increase rail tonnage by a few percentage points. Much more would be needed.

Two, increase the cost of trucking via tolls and other user fees, and impose a greenhouse gas pricing regulation to increase the cost of trucking and so encourage a move to rail. But even this is not enough to challenge the cost-effectiveness and consumer interest in trucks. DOE, therefore, also recommends other actions such as decreasing the driver's service hours and putting limits on the truck size and the weightage of goods that can be transported by road. It also stresses railways in the US will only recover if there is substantial investment in freight rail corridors

The world likes public transport. Not the US



Source: National Geographic Greendex Report 2014, http://environment.nationalgeographic.com/environment/greendex/, as viewed on September 1, 2015

20%

Increase in fuel efficiency of railways since 1980; the number of miles travelled by trucks has increased eight-fold in this period

and better services. Such measures, the report says, require a radical increase in public investment in rail.

This is the problem. Railways in US have always been greatly neglected. By the early 20th century, trucking had already become the dominant mode of hauling freight and much of the railway industry went bankrupt. In 1980, Congress deregulated the private-sector freight transportation industry, which led to massive restructuring — firms were consolidated, routes and services redesigned and prices slashed. Railways lost out.

The DOE says that the freight industry in the US is now "in the midst of another technological revolution". Driven by computers and satellite communication — now, companies can co-ordinate logistics, making the business more effective and further reduce the cost of freight transport.

In this freight technological revolution, railway is losing out. Although the fuel efficiency of railways has increased by 20 per cent since 1980, yet the number of miles travelled by trucks has increased eight-fold. This is when it has the advantage of lower operational costs. A look at the marginal cost per mile of operating a truck in early 2010 reveals fuel cost was 31 per cent and driver labour was 36 per cent. Railways spend less on fuel — 18 per cent of its operational cost and so, it should be able to compete with trucks.

But railways require public investment in infrastructure. Trucks ride on roads the tax-payer pays for. There is no equivalent investment in railway tracks. According to Association of American Railroads in 2013 alone, states disbursed more than US $96 billion on capital outlays and highway maintenance. Other expenses such as administration and planning, law enforcement, interest, and grants to local governments brings the total disbursement for highways, in 2013, to a staggering US $152 billion. Even this is inadequate and given the growth of freight, highway investments will need to be increased.[18]

Ironically, even then the US is not moving rapidly to rail freight. It incentivizes road travel. The federal diesel fuel tax, at US $0.244, has remained unchanged for 20 years — drivers pay a fixed amount regardless of the cost of fuel. This is the fossil fuel subsidy the US government wants developing countries to be weaned off.

But the added problem is the changing nature of consumption in the US. With the rapid growth of e-commerce, goods have to be transported quickly and over shorter distances. The single driving day to meet on-time deliveries means that trucks are favoured over railways. In the short distance transport of good — up to 1,000 miles or 1,600 km trucks are winning. In this situation, railways cannot grow or compete, argue US analysts. The trucking business will grow. But this assertion is questionable, given countries have built dense railway networks to transport goods, even over what could be considered a short distance. So, railways could be in. But it stays out.

No number control is the plan

There is nothing to suggest — including the government's climate change plan — that the US takes the idea of public transport seriously. The entire policy focus is to improve air quality by making cars more efficient. Nothing in its approach signifies that the US has recognised the need for drastic emissions reduction, and so will design policies to restrain car and truck numbers and promote mass transit systems.

It is not that money is not available. It is just not the preferred plan of action of state governments across the country. NRDC researcher Rob Perk, NDRC's transportation advocacy director, writes in his blog that out of the US $53 billion in "flexible" transportation funding available from 2007 to 2011, only about US $5 billion was used for urban public transit.[19]

With regard to rail transport, too, government policies have not been so friendly. Most American passenger trains travel on tracks owned by freight companies. That means most trains have to defer to freight services, leading to lengthy delays and inconvenience for passengers. But road travel is heavily subsidised. And gasoline is cheaper in America than in Europe. And most major highways are toll free. And domestic air travel, too, is cheap and popular.[20]

Such an imbalance in approach begins to look positively lopsided considering the current US strategy of depending on fuel efficiency standards to kick in 2025 is not just risky but also, by all evidence, highly unlikely to bring gains at the scale EPA has projected. The country has to do much more to reduce its total emissions, and in this, the transport sector is already a major contributor and set to rise.

A 2011 report by the Pew Centre (now renamed Centre for Climate and Energy Solutions) finds that it is possible for US transport emissions to be reduced by up to 65 per cent below 2010 levels by 2050, but only if the country adopts policies that include a shift to less carbon-intensive fuels, changing travel behaviour and moving to more efficient modes of transport, like buses or rail.[21] Interestingly, even this analysis underplays the advantage a shift in transport patterns could bring to the US. Instead, in the report's high mitigation scenario, the emphasis is on fuel-shift — moving from gasoline to hydrogen, battery electric or advanced biofuels.

In terms of shifting to more energy efficient modes — rail or public transport — the report is less sanguine. It simply says "moving passenger and freight movement to more efficient modes is well worth pursuing but can be expected to yield only moderate reductions in GHG emissions and fuel use". The reason stated is that public transport supplies only 1 per cent total passenger miles in the US, and that it would be difficult to shift modes in goods transport because of the growing demand for just-in-time delivery and need for flexibility in trucking schedules to meet consumer needs.

More interestingly, the same institute's report on transportation strategies for Shanghai says that car restraint and augmentation of public transport are the only way to reduce carbon emissions.[22] This sauce for

86%

People travelling to work using a car or a van in the US — there has been no change in this scenario over two decades

How the US travels

86 per cent drove

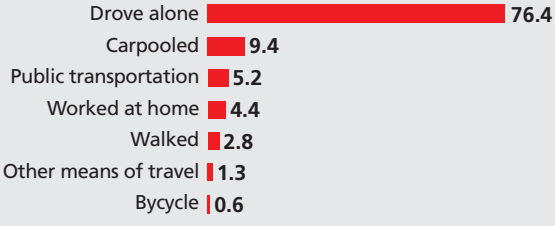
5 per cent took public transport

Car-pooling is down, not up. In 1980 20 per cent car-pooled; in 2013 only 9 per cent

1

At the national level, 5 per cent of commuters use public transport. Public transportation includes bus, trolley, streetcar, subway, elevated rail, railroad, or ferry. These modes collectively account for only a small portion of the nation's overall commutes, but their share can be higher in large metro cities.

How people travel to work: 2013 (in percentage)



Source: US Census Bureau, 2013 American Community Survey, Table 50801

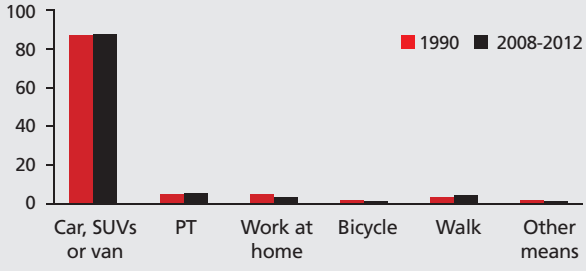
2

Has US changed its travel over the years?

No. It prefers cars and only cars and this has remained unchanged whatever the climate change imperative.

No change in national modal share over time

1990 – 2008-12 (Modal share in percentage)

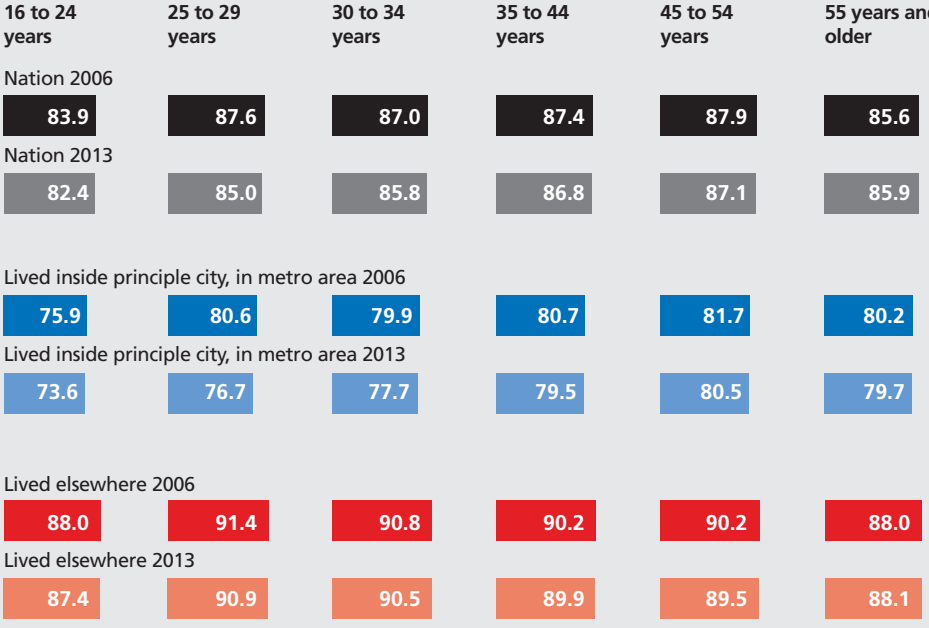


Source: US Census Bureau 2013, American Community Survey data of 1990 and 2008-2012

3

Are the young driving less? Are people in cities driving less?

No and yes. The US Census bureau data finds that contrary to the commonly held perception, there is no evidence that the young are driving less. But yes, people in large metros are driving less because of cost of parking and other constraints — but the decrease is just 2 per cent less between 2006 and 2013. Not much to speak off.

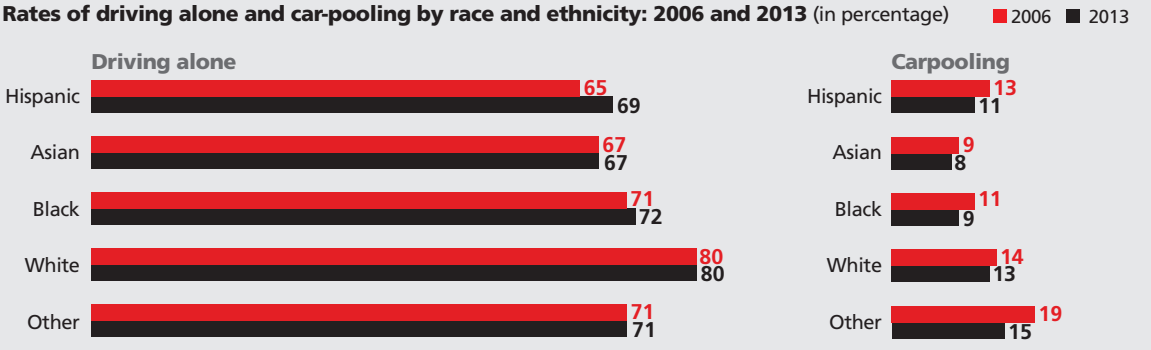


Source: US Census Bureau 2006 and 2013, American Community Survey data of 1990 and 2008-2012

4 Who is car-pooling? Who prefers to drive alone

It is the Hispanic, Asian and Black populations who car-pool — a fact clearly related to income. White population drives alone.

Rates of driving alone and car-pooling by race and ethnicity: 2006 and 2013 (in percentage)



Note: Numbers are rounded. See Appendix table 4 for estimates and margins of error.

Source: US Census Bureau 2006 and 2013, American Community Survey data of 1990 and 2008-2012

5 Is public transport growing in cities?

Greater San Francisco registered the largest decline in automobile commuting of any metro between 2006 and 2013 — but only by 4 per cent. Greater Boston saw car-commuting decline by 3.3 per cent. New York reduced by 2 per cent; However, New York, with its density, high levels of congestion, and extensive transit and rail system remains the metro where the smallest share of workers get to work by car (57 per cent). In other cities, the percentage of car-commute is higher — over 75 per cent in cities like Washington DC to San Francisco and up to 80 per cent in Chicago.

Metro areas among those with the lowest rates of automobile commuting and their second most common commute mode: 2013

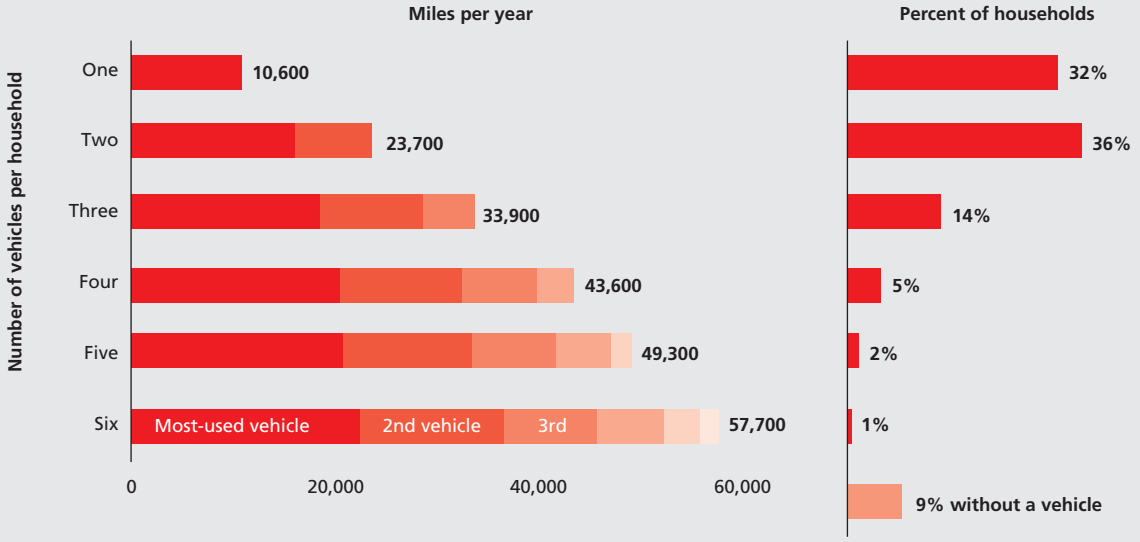
Rank	Metropolitan statistical area	Percentage of workers who commuted by private vehicle	Alternative travel mode with highest commuting share	Second most common commute mode (Percentage of workers)
1	New York-Newark-Jersey City, NY-NJ-PA	56.9	Subway or elevated rail	18.9
2	Ithaca, NY	68.7	Walked	17.5
3	San Feancisco-Oakland-Hayward, CA	69.8	Bus or trolley bus	7.6
4	Boulder, CO	71.9	Worked at home	11.1
5	Corvallis, OR	72.6	Bicycle	8.8
6	Iowa City, IA	73.4	Walked	11.1
7	Boston-Cambridge-Newton, MA-NH	75.6	Subway or elevated rail	6.2
8	Washington-Arlington-Alexandria, DC-VA-MD-WV	75.7	Subway or elevated rail	8.0
9	Bremerton-Silverdale, WA	77.0	Ferry	6.4
10	Missoula, MT	77.2	Walked	8.5
11	Champaign-Urbana, IL	78.4	Walked	7.9
12	Bridgeport-Stamford-Norwalk, CT	78.5	Long distance or commuter rail	7.6
13	Chicago-Napervile-Elgin, IL-IN-WI	79.1	Bus or trolley bus	4.7
14	Urban Honolulu, Hi	79.1	Bus or trolley bus	7.9
15	State College, PA	79.2	Walked	9.9

Source: US Census Bureau 2006 and 2013, American Community Survey data of 1990 and 2008-2012

More cars in a household means more emissions

The US Energy Information Administration points out the obvious, but with a twist — households with more vehicles not only travel more, but often put more miles on their most-used vehicle compared to households with fewer vehicles. In the US, 58 per cent households have more than one car — and 22 per cent have three cars and more. But what is not so obvious is that households with more than one car also use their most-used vehicle more. And they just drive more. Much more.[1]

Average annual vehicle miles of travel per household



Source: EIA 2015, Households with more vehicles travel more, April http://www.eia.gov/todayinenergy/detail.cfm?id=20832, as viewed on September 1, 2015

the goose is certainly not meant for the gander.

What is clear is that the issue of restraining the growth of vehicle miles travelled needs to be built into policy. Over 86 per cent people travel to work using a car or a van; there has been no change in this scenario over two decades. Even in metros, people are driving less because of congestion and parking costs, but only marginally less. The decrease is just 2 per cent between 2006 and 2013. Most cities depend on cars to commute — in Washington DC over 75 per cent use a car to go to work. New York is the country's outlier, but here, too, 57 per cent are by-car commuters. This is not surprising given that the cost of fuel remains low and there is no driver for change.

What is needed is deliberate policy intervention to move people, not cars. But for now, US love affair with only cars is not over. Not at all.


MORTAR. BRICKS ARE PASSÉ... USE SMART MATERIALS
SORIT

- **Residential and commercial sector accounts for 12 per cent of US greenhouse gas emissions. Between 1990 and 2013, CO_2 emissions have increased by 28 per cent.**

- **This sector also accounts for 41 per cent of all energy consumed in the US. It is not expected to reduce.**

- **The size of the building determines energy consumption. And each generation of Americans is building bigger. In commercial buildings, average size in the 1960s was 12,000 sq feet, which grew to 19,000 sq ft in 2000-2012.**

- **While in the 1970s-1980s, people built 1,800 sq ft homes, in the year 2000 the size has increased to well over 2,400 sq ft. In comparison, an average size house in Japan measures 1,420 sq ft, 818 sq ft in UK and 645 sq ft in China.**

- **Energy consumption in homes has gone up, but the proportion used for space heating or cooling is down. The use of electricity for appliances, electronics and lighting has gone up significantly.**

- **US strategy to reduce energy in this sector has been to make improvements via building codes and appliance standards.**

5. Buildings

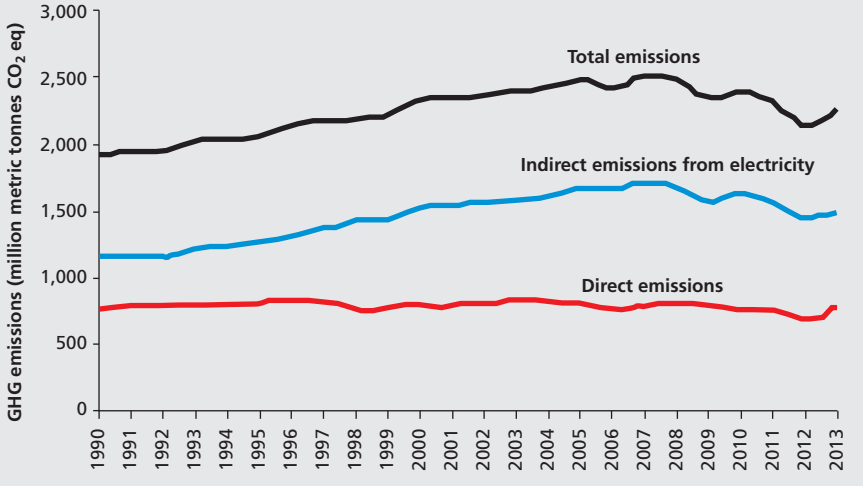
Building sizes are growing, and so therefore, is the energy consumption

In 2013, the residential and commercial sector accounted for roughly 12 per cent of US greenhouse gas emissions.[1] The Environment Protection Agency (EPA) calculates emissions from this sector as those that come from heating, cooking needs, management of waste and wastewater and leaks of refrigerants from homes and businesses. The emissions inventory does not include emissions from generation of power that is used in homes or businesses, only what is consumed. For our analysis we have considered the building sector only. According to the US Energy Information Administration (EIA) in 2014, buildings — homes, offices, malls and factories — accounted for about 41 per cent of all energy consumed in the US.[2]

The EPA reports that emissions from the building sector are up, not down. Between 1990 and 2013, carbon dioxide (CO_2) emissions from homes and businesses have increased by 28 per cent (see Graph 5.1: *Emissions from homes and businesses*).[3] The growth is led by indirect emissions from the lighting, heating, air conditioning and appliances homes and businesses use. Direct emissions — from fireplaces and burning of fuel in homes — have increased by 1 per cent in the same period. And if at all there is a fluctuation in emissions quantum, it is because of short-term changes caused by weather conditions: colder or hotter seasons require more heating or cooling (see Box: *A degree above or below*).

Graph 5.1: Emissions from homes and businesses

CO_2 emissions have increased by 28 per cent between 1990 and 2013

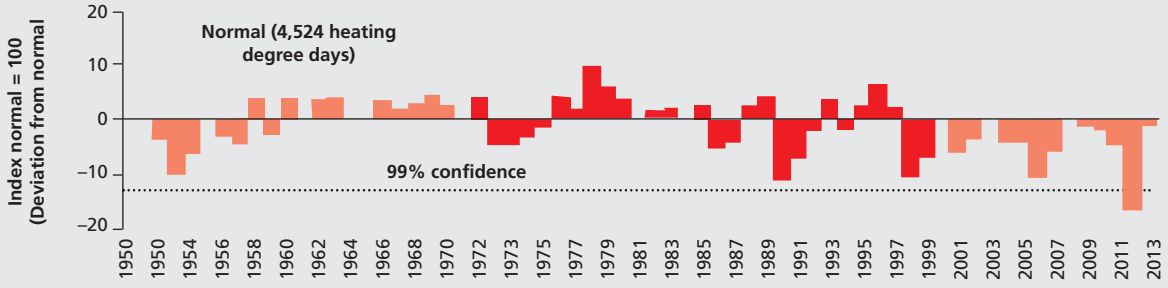


Source: EPA Commercial and Residential Sector Emissions available at http://epa.gov/climatechange/ghgemissions/sources/commercialresidential.html, as viewed on August 31, 2015

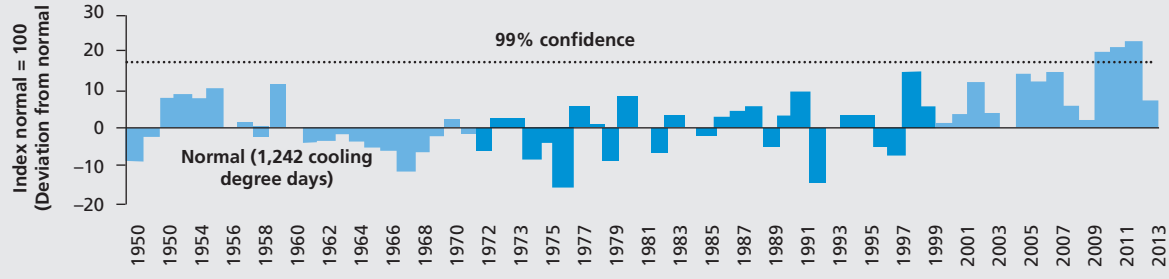
A degree above or below

Colder and hotter seasons increase electricity use, and this is in turn leads to fluctuations in emissions from residential and commercial buildings as people crank up the heating or air-conditioning. The EPA defines heating degree days as those below or above 65°F (18°C).

Graph 5.2: Annual deviations from normal heating degree days (1950-2013)



Graph 5.3: Annual deviations from normal cooling degree days (1950-2013)



Source: EPA Commercial and Residential Sector Emissions available at http://epa.gov/climatechange/ghgemissions/sources/commercialresidential.html, as viewed on August 31, 2015

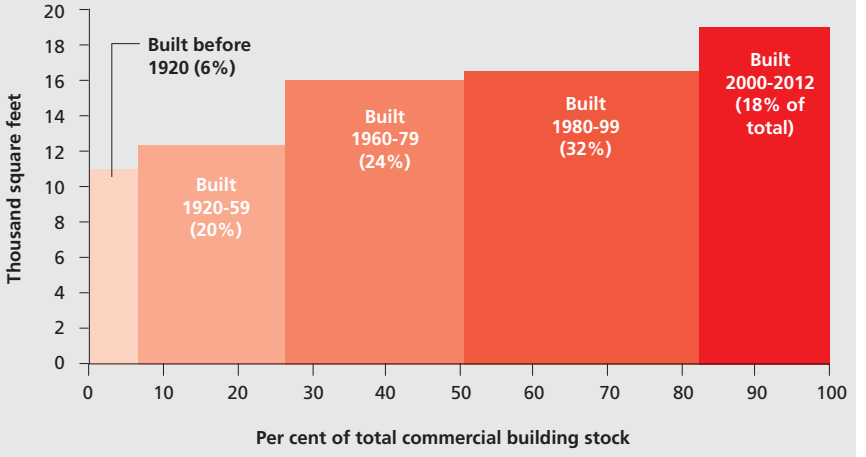
Commercial sector: growing in size

The EIA defines a commercial building as one bigger than 1,000 square feet (sq ft) and devoting more than 50 per cent of its floor area to activities that are not residential, agricultural or industrial. Its 2015 Commercial Building Energy Consumption Survey says there were 5.6 million commercial buildings in the US in 2012, comprising 87.4 billion sq ft of floor space, an increase of 14 per cent in building numbers and 21 per cent in floor area as compared to 2003.[4]

The size of a building is key to how much energy it will consume. EIA finds that between 1979 and 2012, the size of buildings outpaced the increase in 'building stock' — the number of buildings constructed (see Graph 5.4: *Average commercial building sizes*). While the number of commercial buildings increased from 3.8 million to 5.6 million, commercial floor space increased from 51 billion sq ft to 87 billion sq ft. "A growing

Graph 5.4: Average commercial building sizes...

...have outpaced the number of buildings constructed



Source: EIA 2015, A look at the US Commercial Building Stock: Results from EIA's 2012 Commercial Buildings Energy Consumption Survey (CBECS), 2015, Energy Information Administration (EIA) available at http://www.eia.gov/consumption/commercial/reports/2012/buildstock, as viewed on August 31, 2015

population has led to a need for more buildings and the changing needs and wants of consumers has led to larger buildings," notes the EIA report. What is of greater concern is buildings being constructed today are bigger than those that have been constructed yesterday, or a year ago. This means that all efforts to cut emissions in this sector will be greatly hampered as the size determines the quantum of energy used — and so the emissions. Overall, more than half of the energy used in commercial buildings is used for space heating (36 per cent) and lighting (21 per cent). The average size of commercial buildings in the 1960s-70s was 12,000 sq ft, growing to 19,000 sq ft in 2012.

Residential sector: high on energy

Homes consume more energy than businesses in the US. The key concern in this context is that the US is losing the efficiency edge because houses have become larger and are more chock-full of appliances. The non-negotiable American consumption patterns are negating any gains made in bringing down greenhouse gas emissions via more efficient appliances. The EIA finds that, in the last decade, energy used to heat and cool houses has come down, but total energy use has not decreased. This is because the number of appliances has increased dramatically: in 1993 they consumed 24 per cent of all electricity used in homes which increased to 35 per cent by 2009. In contrast, space heating and cooling has come down from 58 per cent in 1993 to 48 per cent in 2009 (see Graph 5.5: *Energy consumption in homes by end use*).[5]

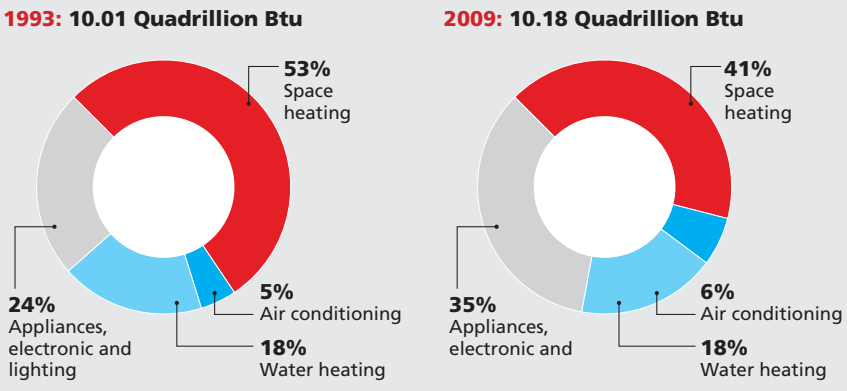
Energy use in homes is not expected to come down. A key reason is that the stock of buildings is old, long-lived and therefore inefficient.

35%

of a household's energy bill taken up by appliances in 2009

Graph 5.5: Energy consumption in homes by end use

Energy use for heating and cooling has dipped, but total use has increased because of increased appliance use



Source: EIA 2013, Heating and cooling no longer majority of US home energy use, March 7, available at http://www.eia.gov/consumption/residential/, as viewed on August 31, 2015

Another is that the US is still constructing more homes. From 2000 to 2010, US population increased by 9.7 per cent, the number of housing units increased by 13.6 per cent and urban land area increased by 15 per cent. The EIA projects that while the residential sector's energy intensity will decline by 16 per cent between 2012 and 2040, total energy consumed will increase by 5 per cent. In other words, even as energy use in homes will become more efficient, people will use more energy because they will need more energy for newer homes, larger homes or for more and more appliances.[6]

Consumption matters

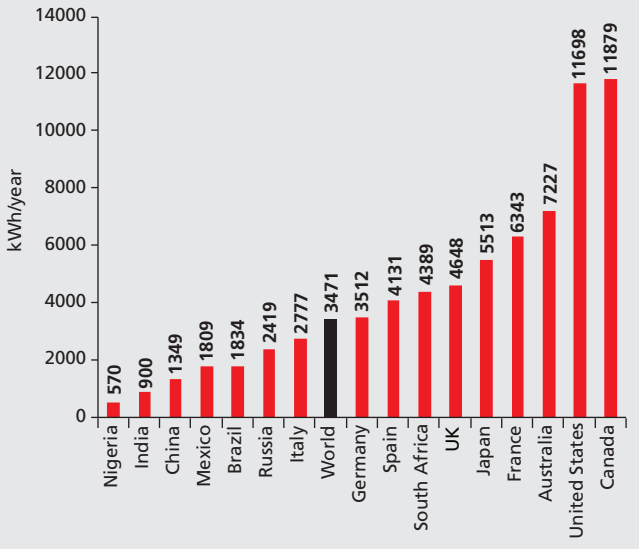
A typical American household consumes about 13 times more electricity than an Indian household, nine times more than a Chinese household and two-three times more than a European household. Even if we compare the US with other equally developed countries, it is high on its energy needs. In 2010, while a German household annually consumed 3,512 kilowatt-hour (kWh) and its neighbour France 6,343 kWh, their energy needs paled into insignificance when compared to an American's yearly consumption of 11,698 kWh. Now compare this to 570 kWh for an average Nigerian household.[7]

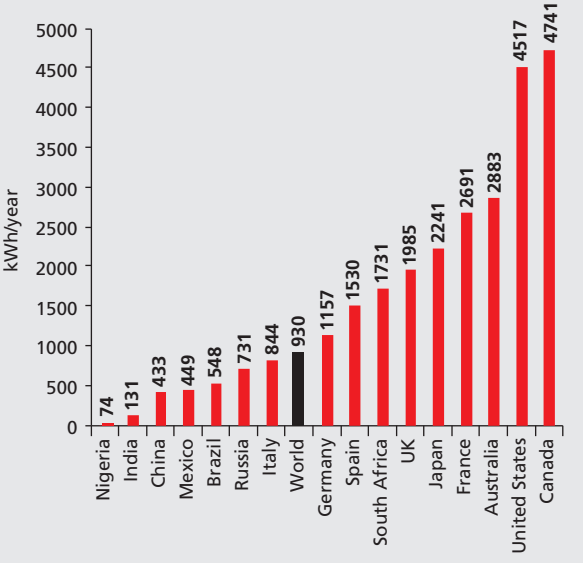
The per capita power consumption in US homes is even starker. Each American uses about 4,517 kWh per year in his/her home. This means an American consumes 1.5 times more than a French citizen, almost 2.2 times more than a Japanese or British citizen and 2.6 times more than a German. This usage is about six times higher than the global per capita average.

Graph 5.6: Household electricity consumption

Graph 5.7: Per capita residential electricity consumption

Compared to other countries, rich and poor, the US's residential energy needs are very high





Source: World Energy Council 2010, Energy and Urban Innovation, London

Extended to a few developing countries, the comparison becomes truly odious. An average American's consumption of electricity is five times more than a South African's, 10 times more than that of a Chinese and a whopping 34 times more than an Indian. A poor country like Nigeria consumes 61 times less electricity in homes per capita than the average US citizen (see Graphs 5.6 and 5.7: *Household electricity consumption* and *Per capita residential electricity consumption*).

Size matters

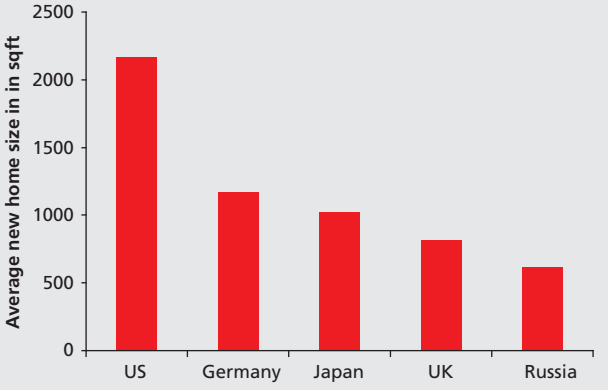
US household electricity consumption has increased 39 per cent since 1970. Along with appliance use, this is due to size. The US is still building mega-size homes measuring 6,400 sq ft, which consume 24,500 kWh of electricity per year. An average-size home of 1,600 sq ft, by contrast, uses up 9,500 kWh of electricity per year.[8]

The EIA report finds this has increased over the decades. In the 1970s and 1980s, people built 1,800-sq ft houses, which in the first decade of 2000 increased to over 2,400 sq ft.[9] In comparison, the average size house measures 1,420 sq ft in Japan, 818 sq ft in the UK and 645 sq ft in China.[10] The large size homes translate into more appliances and more energy consumption (see Graphs 5.8-5.10).

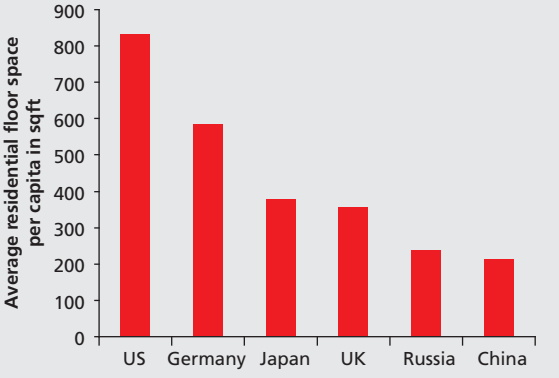
Electricity consumed at home by 1 American =

1.5	x citizen of France
2.2	x citizen of Japan
2.2	x citizen of the UK
2.6	x citizen of Germany
5	x citizen of South Africa
10	x citizen of China
34	x citizen of India
61	x citizen of Nigeria

Graph 5.8: Average new home size (square feet)

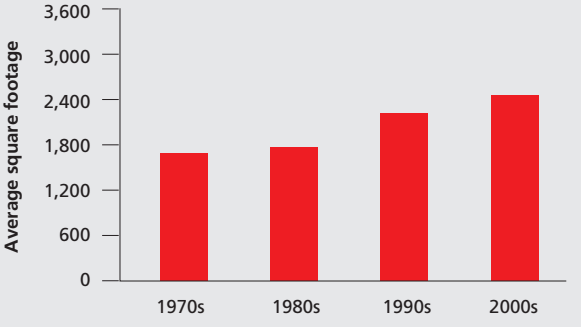


Graph 5.9: Per capita average floor space



Source: Anon, How big is a house, average house size by country, Shrink that Footprint, http://shrinkthatfootprint.com/how-big-is-a-house, as viewed on August 31, 2015

Graph 5.10: US homes get bigger every decade



Source: EIA 2009, The impact of increasing home size on energy demand, http://www.eia.gov/consumption/residential/reports/2009/square-footage.cfm, as viewed on August 31, 2015

US household electricity consumption has increased 39 per cent since 1970. Along with appliance use, this is due to size. The US is still building mega-size homes measuring 6,400 sq ft, which consume 24,500 kWh of electricity per year. An average-size home of 1,600 sq ft, by contrast, uses up 9,500 kWh of electricity per year.

In the 1970s and 1980s, people built 1,800-sq ft houses, which in the first decade of year 2000 increased to over 2,400 sq ft.

The number of appliances matter

Per capita electricity consumption in the residential sector has increased by 19 per cent since 1990. In the commercial sector, it has gone up by 27 per cent. Increased appliance use seems the single most important factor for this rise (see Graph 5.11: *Per capita retail electricity sales*). According to an EIA study on the energy homes consume, in 2009 roughly 45 per cent households had three or more televisions and over 75 per cent had computers.[11]

America is also rapidly switching over to air conditioners for cooling. According to a EIA, 87 per cent of US households have central air conditioning, up from 24 per cent in the late 1970s.[12] As a matter of grave concern, the US has long consumed more energy each year for air

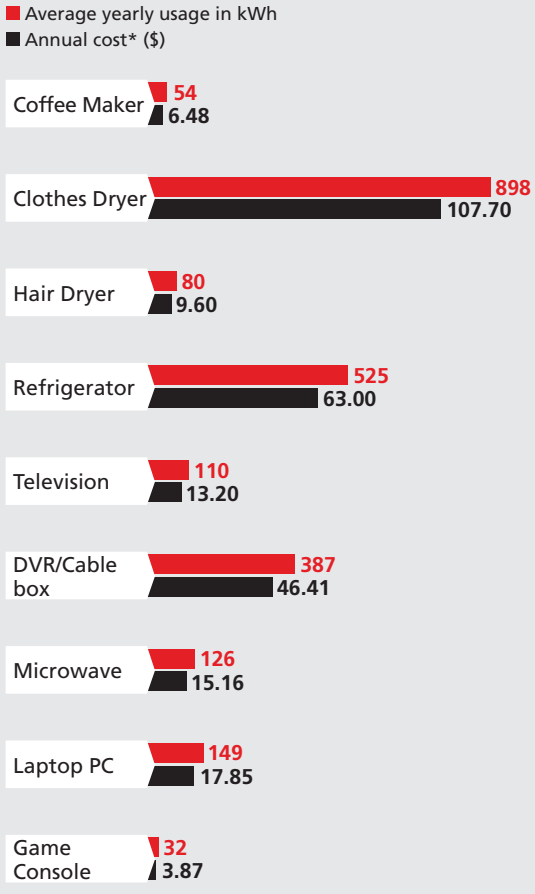
Appliance abuse

The per capita electricity consumption in the US residential sector has increased by 19 per cent since 1990. Increased appliance use seems the single most important factor for this increase.

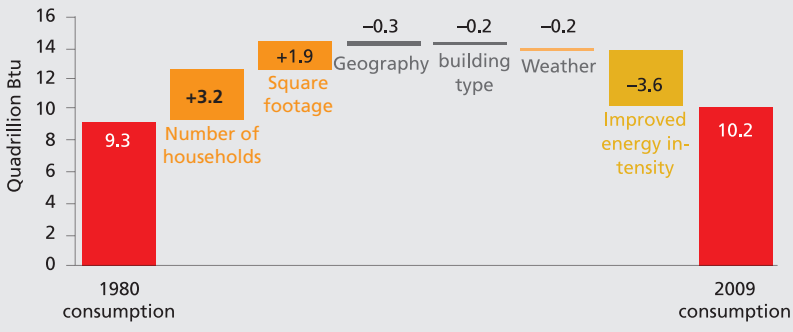
Appliance abuse means the exorbitant use of appliances: Coffee maker, clothes dryer, television, hair dryer, microwave, refrigerator, video game console and laptop or PC. All, most gregariously used ever since CE replaced BC. Especially in the US.

- In 1990, 23 per cent US households used electricity for space heating. In 2009, 35 per cent.
- In 1990, 15 per cent US households had two or more refrigerators. In 2009, 23 per cent.
- In 1990, 53 per cent US households had electric clothes dryers. In 2009, 63 per cent.
- In 1990, 28 per cent US households had two or more televisions. In 2009, 44 per cent.
- In 1997, 6 per cent US households had two or more computers. In 2009, 35 per cent.
- In the late 70s, 27 per cent US households had central air-conditioning. In 2011, 64 per cent. **The US uses more electricity for cooling than the entire continent of Africa consumes for all purposes.**

APPLIANCE ENERGY CONSUMPTION



FACTORS INFLUENCING CHANGES IN RESIDENTIAL DELIVERED ENERGY BETWEEN 1980 AND 2009



1980-2009, delivered energy used by US households increased: 9.3 quadrillion British Thermal Units (quads) to 10.2 quads. Energy intensity declined 37 per cent. But much of this gain was lost because house sizes increased 20 per cent.

Source: EIA 2015, energy efficiency improvements have largely offset the effect the more and bigger homes

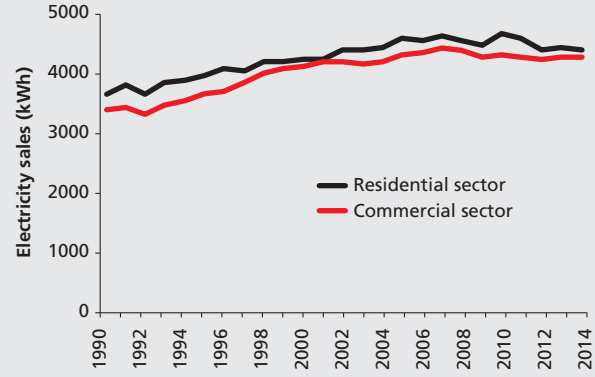
conditioning than the rest of the world combined. In fact, the US uses more electricity for cooling than the entire continent of Africa, home to a billion people, consumes for all purposes. In sharp contrast, a 2008 Mintel report found that just 0.5 per cent of houses and flats in the UK had any kind of air conditioning.[13]

The 'peak' energy consumption on hotter days — a typical home consumes 20-30 per cent more electricity overall on the hottest days, relative to an average summer day — comes at another cost. During this time when ACs are eating up energy, the extra energy is provided by power plants called 'peaker plants' which are otherwise idle and shudder to life only when demand peaks. These plants are old and inefficient, and consume high energy and generate high emissions.[14]

Since electricity rates have remained stable, the spike in energy use is obviously due to appliances. For instance, among other utility items, clothes dryers use maximum energy. In the US, 85 per cent households own tumble dryers, as compared to 57 per cent in the UK. In many countries people hang-dry clothes, a practice not popular in US. In fact, in the US, many states have banned the use of outdoor drying. An energy-foolish decision, for according to Opower, a blog on innovative energy solutions, drying of clothes accounts for 6 per cent of the country's energy bills and costs roughly US $9 billion annually.[15]

Graph 5.11: Per capita retail electricity sales

Consumption has increased in both sectors, mainly due to appliance use



Source: Graph generated by the Centre for Science and Environment, based on Energy Information Administration dataset.

Policies for buildings: enough to bend the curve?

What is the US government doing to reduce emissions from the residential and commercial building sector?

US policy has been to nudge improvements via building codes and appliance standards. While building codes are enacted at the state level, the Federal government sets efficiency standards and mandatory labelling for appliances. This is complemented with rating schemes (which certify buildings) and incentives from the Federal government, states and even utilities for improved efficiencies.[16]

In his first term, President Obama introduced appliance efficiency standards for nearly 40 products, announced a scheme for 'weatherising' more than one million homes, and recognised superior energy savings across more than 65 product categories. In 2011, the Obama administration prioritised commercial buildings and pledged to make them 20 per cent more efficient by 2020. An executive order states a goal to design all new federal buildings to achieve net zero emissions, but 2020 onwards. Other goals are to reduce energy use in residential homes by 30-50 per cent

1980: 9.3
2009: 10.2
Energy used by US households (in quads)

relative to 2009 for new buildings and relative to current energy use for existing buildings. But no dates are specified for these goals.

In President Obama's Climate Action Plan announced in June 2013, the Department of Energy set a goal to reduce carbon emissions by 3 billion metric tonnes cumulatively by 2030, combining standards for appliances and federal buildings (set in the President's first and second terms) with energy conservation standards.

Are the measures, taken through local enforcement of building codes and stricter appliance standards, enough to reduce emissions in this growth area? The past decade's experience shows clearly that all the substantial gains made in reducing the energy intensity of appliances or improving building insulation and design have been lost because of increased consumption. The EIA report for the past decade shows clearly how the gains in energy efficiency are being squandered away because of newer and bigger houses and growing number of appliances. Between 1980 and 2009, delivered energy used by US households increased from 9.3 quadrillion British Thermal Units (quads) to 10.2 quads — an increase of 9 per cent. Although, in the same period, energy intensity declined by as much as 37 per cent, all the gain was lost because more houses were built and house sizes increased by 20 per cent; at the same time, people bought many more and larger appliances.[17] So, why would anything change now?

How change is made: China and Germany vs US

A 2013 report by Climate Policy Initiative compares building energy efficiency in China, Germany and the US. It finds that total energy consumption in German residential and commercial buildings fell between 1996 and 2008.[18] Most dramatically, the use of energy for space heating decreased significantly. This occurred because of government policies targeted at retrofitting thermal envelopes and replacing heating systems along with drastic improvement in appliance standards. Also, unlike in the US, in Germany electricity price has increased, and has become a major driver in improving efficiency and demand.

The reduction in Germany's emissions is not accidental. It is driven by clear policy. Its 2010 German Energy Concept policy has specified national efficiency goals, including an ambitious target of 80 per cent primary energy demand reduction, by 2050, for the buildings sector. Mid-term goals include reducing heating demand by 20 per cent by 2020; ensuring all new buildings are climate neutral by 2020; and increasing the thermal retrofit rate to 2 per cent. Japan has specified an energy efficiency target of 30 per cent by 2030 for this sector.[19]

Moreover, German policy is not voluntary — like the rating of the building sector in the US. The Energy Saving Ordinance includes an energy efficiency building code which mandates a standard for primary energy use in each building. It allows building owners to use a combination of insulation, heating and ventilation systems to achieve this standard. The

code also sets a requirement for maximum heat loss. This is incentivised by preferential loans to buildings that surpass the standard.

Germany has also introduced policies to promote integrated renewable energy in space heating — its renewable energy act sets a minimum standard for renewable heat production in new buildings.

In the case of the US, in contrast, energy consumption in residential buildings has gone up between 1998 and 2008. Unlike Germany, where space heating is dramatically down, in the US it has remained constant. This shows efficiency gains in the US have been lost because larger floor areas were built. Or, gains were not substantial in the first place because building codes remain voluntary and weak. What is worrying is that all other energy use has gone up — from air conditioning to electronics. This means gains from improvement in appliance standards have, again, been negated by increasing use.

The US building energy efficiency codes and enforcement still lags behind other countries. A report by the American Council for Energy Efficient Economy compares the building efficiency standards of different countries and finds that the US is below most countries when it comes to setting building codes and enforcement of standards[20] (see Table 5.1: *Building efficiency standards of different countries*).

The 2013 CPI paper that compares China, Germany and the US clearly establishes that the US is both massive in its energy consumption in this sector, but also that its policy to reduce emissions is weak and inadequate. There are also 'behaviour' issues — driven by price and

Table 5.1: Building efficiency standards of different countries

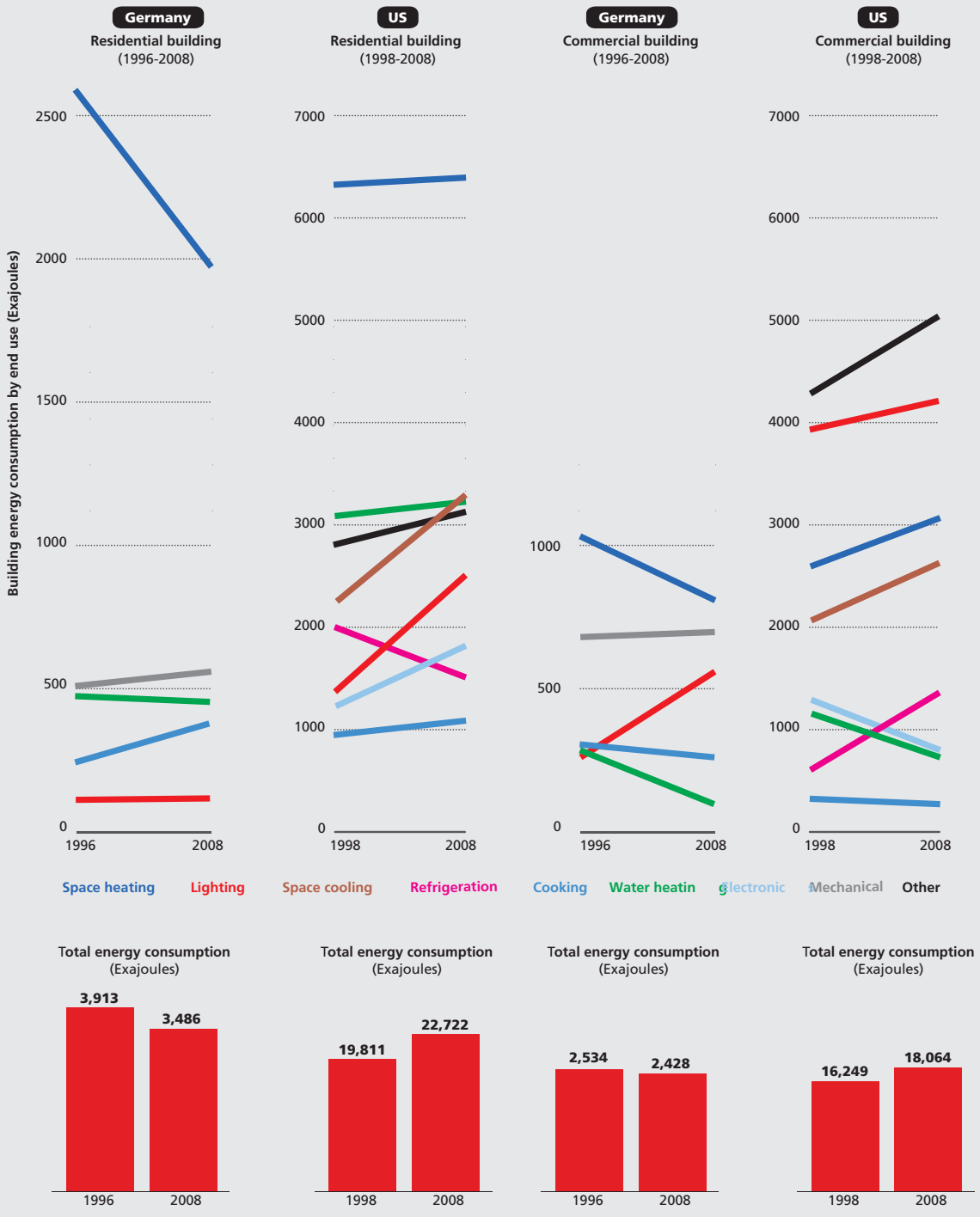
The US building energy efficiency codes and enforcement still lags behind other countries

	Building enrgy codes	Technical requirement in residential	Technical requirement in commercial	Enforcement mechanisms for residential	Enforcement mechanisms for commercial	Total points
China	3.5	1.5	1.25	3	3	12.25
Australia	4	1.75	1.5	2	2	11.25
South Korea	4	1.75	1.5	2	2	11.25
United Kingdom	4	1.75	1.5	2	2	11.25
France	4	1.5	1.25	2	2	10.75
Canada	3	1.5	1.25	2	2	9.75
Spain	4	1.75	1.5	1	1	9.25
United States	3	1.25	1	2	2	9.25
Germany	3.5	1.75	1.5	0	1	7.75
Russia	3	1	0.75	2	1	7.75
India	2	0	1.5	2	2	7.5
Brazil	0	0	0	3	3	6
Japan	3.5	1.25	1.25	0	0	6

Source: American Council for Energy Efficient Economy, 2014.

Germany 1–US 0 (own goal)

Germany has worked to bring its home and office energy use down — unlike the US



affordability triggers in many cases — that make each country's story different and better.

The paper finds, for instance, that Chinese residential buildings are kept colder in winter and warmer in summer as compared to those in the US (see Graph 5.12: *Comparing temperatures at which the US and China switch on heating and cooling*). This behaviour is related to price — US electricity prices relative to income are very low and have remained so. In China, the ratio of price to income was high in the past, but is now steadily falling as people get richer. In Germany, where space heating is reducing — the price of energy to per capita income is relatively constant, but is more than twice that of the US. This acts as a deterrent along with policies that drive the change. So, in these trends, Chinese households would be expected to consume more energy as incomes rise, unless, like in Germany, deliberate efforts are made to curtail that use.

The CPI paper also finds that China's energy consumption in residential buildings increased, between 1996 and 2008, from 2,158 exajoules to 6,562 exajoules — but its base is low. In comparison, energy consumption in residential buildings in the US in 2008 is 22,722 exajoules — over three times more than China's.[21]

Huge

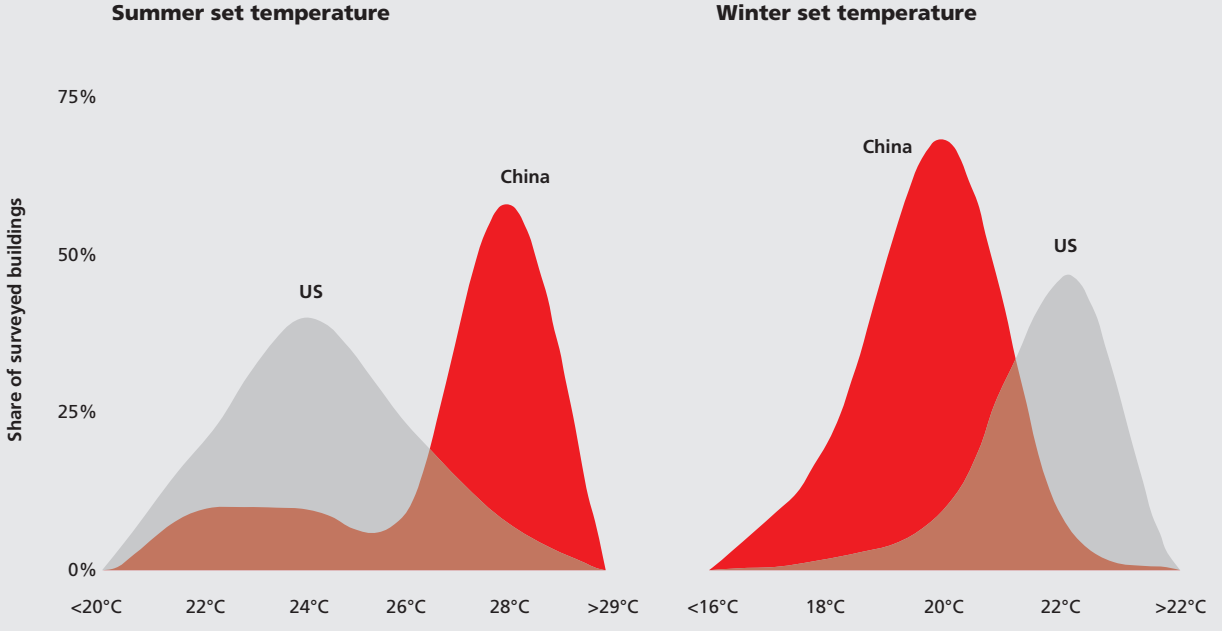
Energy consumption of the US in this sector

Weak

Policies to reduce emissions

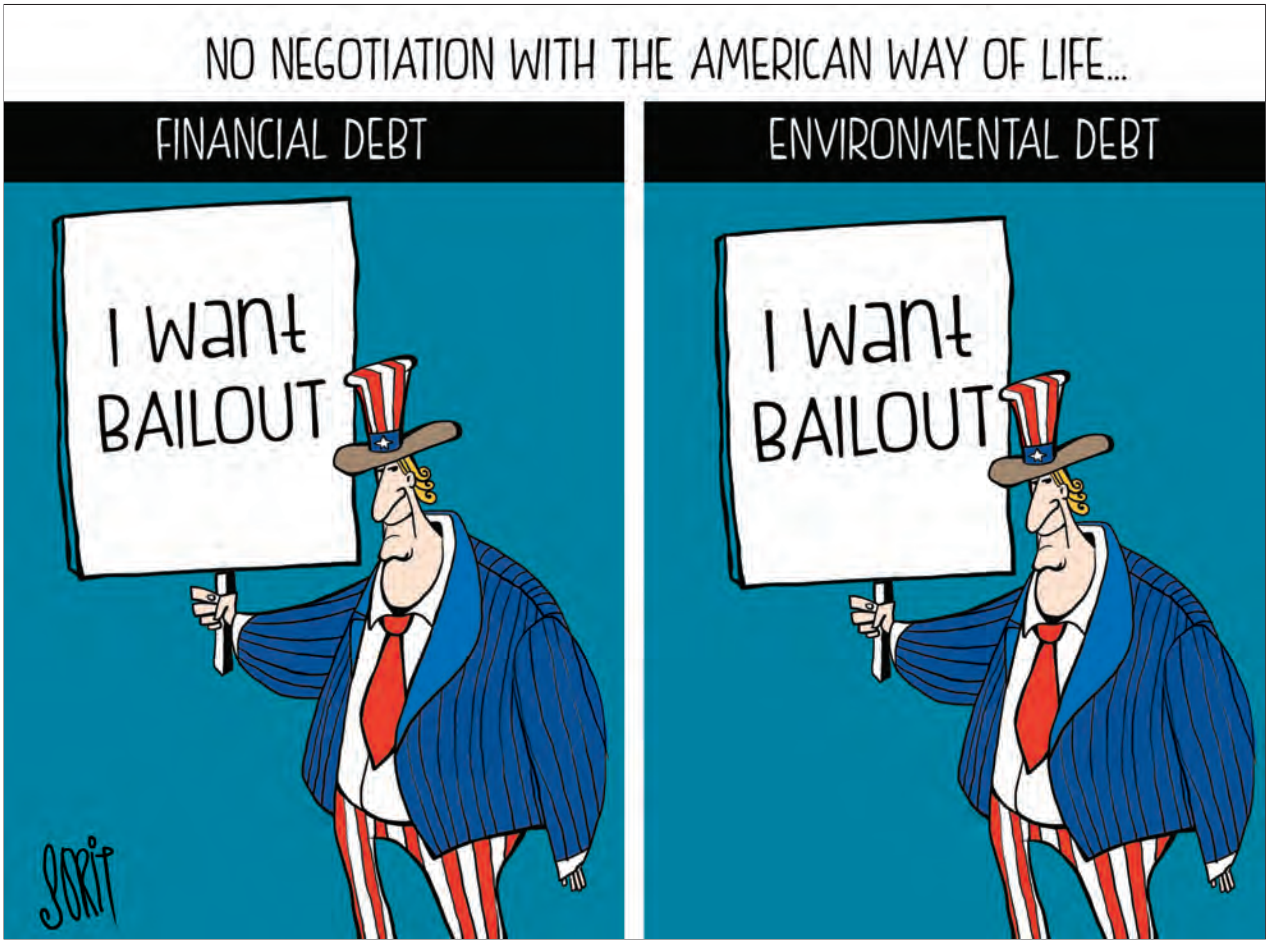
Graph 5.12: Comparing temperatures at which the US and China switch on heating and cooling

Chinese residential buildings are kept colder in winter and warmer in summer as compared to those in the US



Source: Hermann Amecke, Jeff Deason, Andrew Hobbs et al 2013, Building energy efficiency in China, Germany and the United States, Climate Policy Initiative assessed at http://climatepolicyinitiative.org/wp-content/uploads/2013/04/Buildings-Energy-Efficiency-in-China-Germany-and-the-United-States.pdf

Clearly, the US strategy of relying entirely on energy efficiency is not adding up. It needs to set ambitious national goals for this sector — targets for energy use, emissions and floor space control. And goals that are enforceable and can be strictly monitored. But all this will not be enough if it does not look at how it can change consumer behaviour so that what the consumer does reflects the cost to the Planet. Currently, all behaviour in the US is driven by the fact that the price of energy is kept constant and low — it leads to change that is meaningless.


NO NEGOTIATION WITH THE AMERICAN WAY OF LIFE...
FINANCIAL DEBT
I want BAILOUT
ENVIRONMENTAL DEBT
I want BAILOUT

- **In 2013, the US industrial sector accounted for 20 per cent of total US greenhouse gas emissions.**

- **Emissions and energy consumption has declined in this sector — the reason could be the shift in US economy from manufacturing to services.**

- **Consumption of goods has increased, but the US is not making these goods. Instead, it has outsourced their manufacture to other countries. This means industrial emissions have not gone down, but merely been outsourced.**

- **In terms of value, more than half of the goods consumed in the US is imported. In the last 15 years, imports of energy-intensive industrial supplies and materials (cement, steel, chemicals etc) have more than tripled.**

- **Cement is the most intensive energy consuming sector in the US, and contributes significantly to emissions. The industry continues to grow, and has set a very unambitious target.**

- **The oil and gas industry is a major contributor to methane emissions: 29 per cent of US's total. The sector is responsible for considerably more GHG pollution than was previously believed.**

- **The US iron and steel industry has managed to reduce its emissions, but it can do much more.**

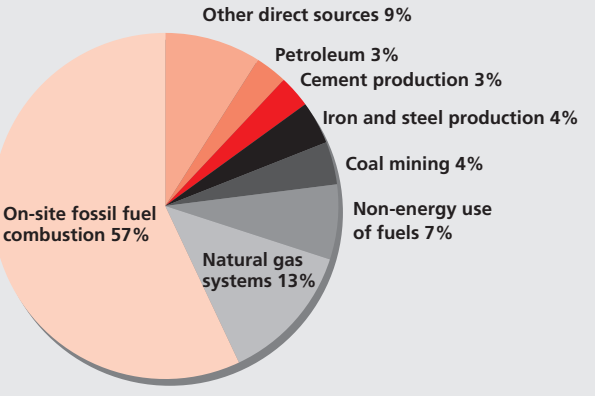
6. Industry

Industrial emissions have not gone down; they have merely been outsourced

The US industrial sector was responsible for 20 per cent of total US greenhouse gas (GHG) emissions in 2013. It is the only sector where energy consumption as well as carbon dioxide (CO_2) emissions have declined. Between 1990 and 2013, the sector's emissions declined 12.3 per cent.[1] However, the reduction may well be related to structural changes in the US economy, which has shifted from manufacturing to services.

Graph 6.1: Sources of emissions

The sector accounted for 20 per cent of total US GHG emissions in 2013



Source: EPA 2014

Does this reduction in emissions show the US has reduced its consumption of industrial goods? No. In fact, the consumption of goods has skyrocketed. Instead of producing these goods domestically, manufacturing has largely been 'exported' — emissions are now added to the balance sheet of those countries which make things for the US to consume. Between 1990-2014, the index of real personal consumption expenditure on goods doubled. And more and more of this consumption is met by imports. Over the past 24 years, import of goods into the US has gone through the sky: almost a five-fold increase. Most of these goods were energy-intensive industrial supplies and materials. Therefore, industrial emissions have not gone down, but have merely been outsourced (see Box: *Importing goods, exporting pollution*[2]).

What about industries operating within the country? According to the EPA's 2014 emissions inventory, the switchover of ozone-depleting substances such as CFC to HFC, iron and steel, cement and petrochemical production are the key contributors (see Graph 6.1: *Sources of emissions*). The EPA accounts for fossil energy used in industry for manufacture and also emissions from the industrial process itself.

Cement

Cement is the country's most intensive energy-consuming sector. The US cement industry consists of 107 cement plants across 36 states.[3] After a brief slump in cement consumption in 2009, the US cement industry has recovered and continues to grow (see Graph 6.7: *Cement consumption*).

The US remains the world's third largest consumer of cement after China and India, both emergent economies.[4] The US consumed 79 million tonnes of cement in 2012, the combined consumption of Japan and Mexico in that year. Therefore, despite its high development status,

Importing goods, exporting pollution

In 2014, the industrial sector in the US consumed 2 per cent less energy than what it had in 1990. In fact, post-2000 the trend in total energy consumption has been a decreasing one. The reduction in per capita energy consumption is even greater — down by 23 per cent (1990-2014).

Data indicates that over the past 25 years, the contribution of the US manufacturing sub-sector (the largest and most energy-intensive sub-sector of the industrial sector) to the gross domestic product (GDP) has significantly reduced. In 1990, this sub-sector contributed 16.7 per cent to the GDP; in 2014, 12 per cent. Clear evidence the sub-sector is shrinking vis-a-vis other sectors.

But has the consumption of industrial goods and services also gone down?

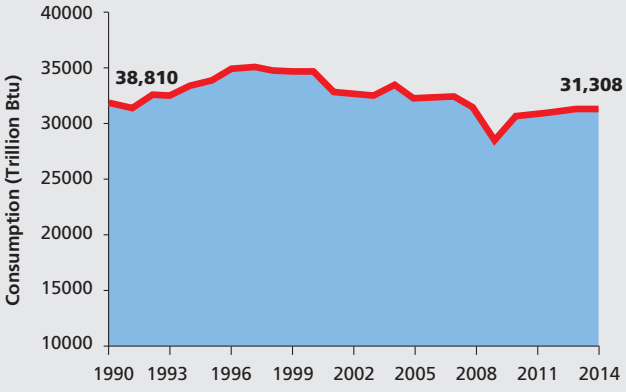
Ample data exists to show the consumption of all goods, including industrial goods, has increased. In terms of nominal dollars, the personal consumption expenditure on goods (including durables such as vehicles or electronics and non-durable goods such as food and beverages, clothing and footwear) has increased from US $1,500 billion in 1990 to $3,950 billion in 2014 — a rise of 165 per cent.

From 1990 to 2014, the index of real personal consumption expenditure (Index number, 2009 = 100) on goods has more than doubled. So, both in nominal and real dollar terms, consumption of goods has at least doubled. From this data, it is difficult to quantify the increase in the amount of goods consumed in the US. But it is quite clear the US consumes significantly more goods today than what it did in 1990.

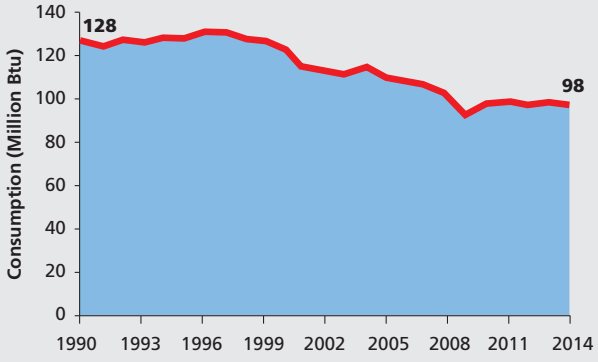
And more and more of the demand for goods is being met by imports. In 1990, only US $500 billion worth of goods were imported to the US; in 2014 it was US $2,374 billion — an almost five-fold increase.

In 1990, the value of imported goods accounted for about 33 per cent of the total personal consumption expenditure on goods; in 2014, 60 per cent. In terms of value, therefore, more than half of goods consumed in the US is imported.

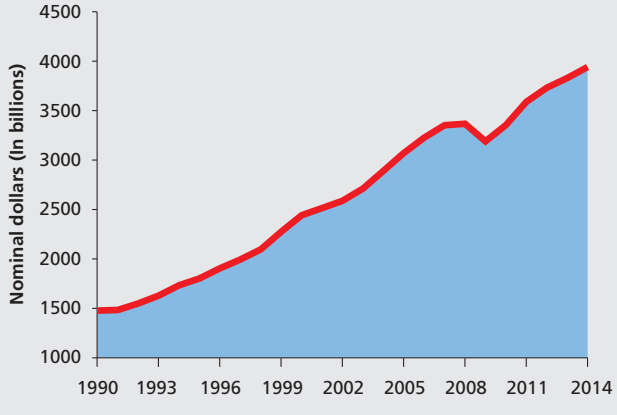
Graph 6.2: Total energy consumption



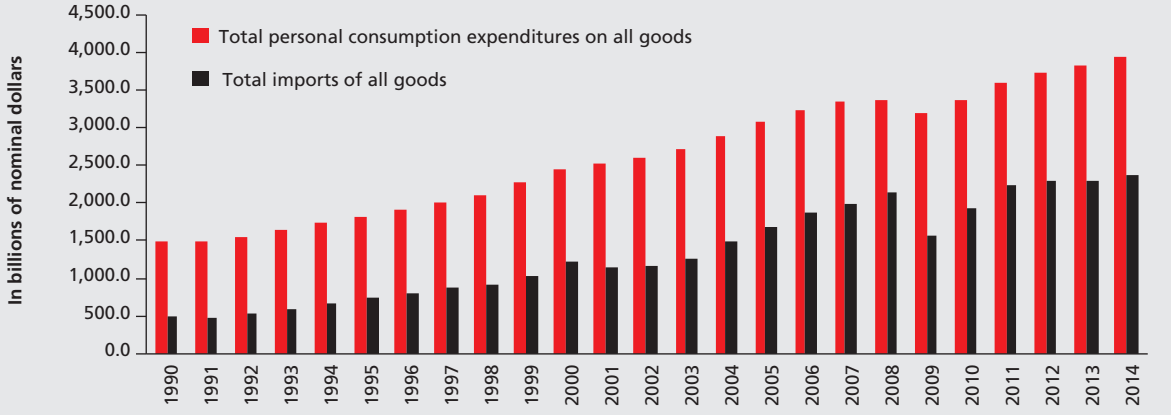
Graph 6.3: Per capita energy consumption



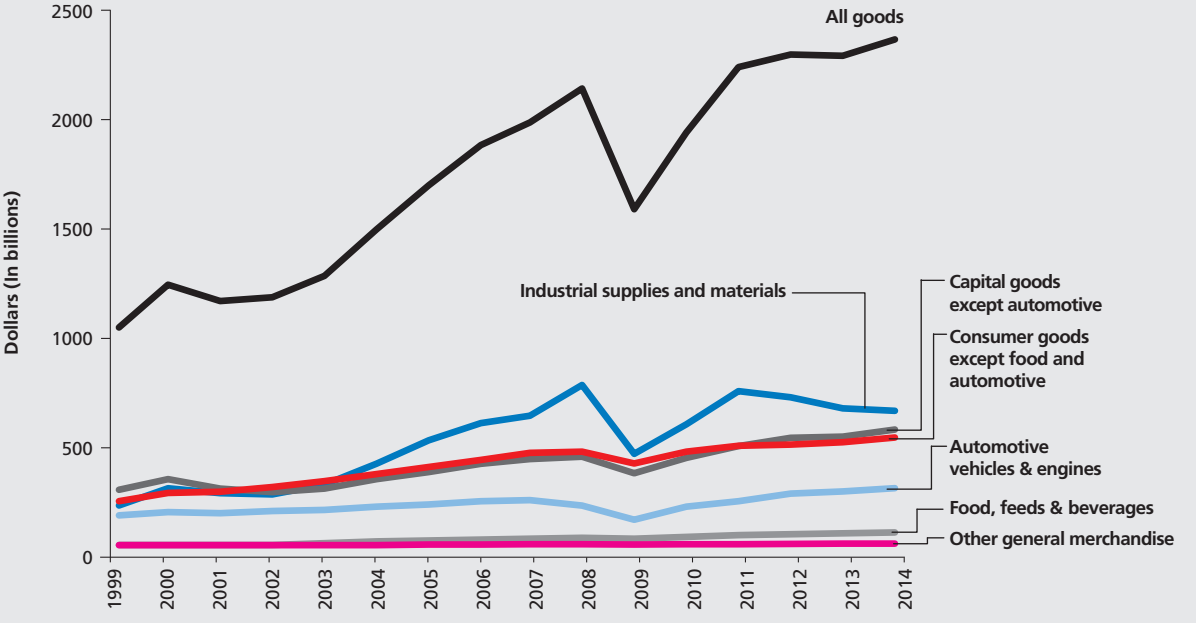
Graph 6.4: Total personal consumption expenditure on all goods



Graph 6.5: Consumption of goods vs import of goods



Graph 6.6: What kinds of goods does the US import



Sources: For Graphs 6.2 and 6.3 — USEIA; for Graph 6.4 — data on personal consumption expenditure released by Bureau of Economic Analysis, 2014; for Graphs 6.5 and 6.6 — data on US international transactions released by Bureau of Economic Analysis, 2015

So, what kinds of goods is the US importing?

In 2014, the main goods imported to the US in terms of value were industrial supplies and materials (28 per cent of all imported goods), capital goods except automotive (25 per cent), consumer goods except food and automotive (24 per cent), automotive vehicles, parts and engines (14 per cent) and foods, feeds and beverages (5 per cent).

Thus in the last 15 years, the imports of energy-intensive industrial supplies and materials (which includes cement, steel, chemicals, other metals and non-metals) have more than tripled. The imports of capital and consumer goods have also doubled during this period. The US, therefore, has outsourced a significant proportion of its energy-intensive industrial production.

Far far away from Plymouth Rock

Although US policymakers hate the word 'outsourcing', they love outsourcing pollution.

In 2014, the US industrial sector used up 2 per cent less energy than what it used up in 1990. 1990-2014, the sector's per capita energy consumption has reduced 23 per cent. Why? What's happening?

The US manufacturing sub-sector has been shrinking. Its contribution to GDP — Gross Domestic Product, the total value of goods produced and services provided in a country during one year — was 16.7 per cent in 1990. In 2014: 12 per cent. In other words, a lot of industrial goods or the stuff people like to buy are not being made in the US anymore.

Does that mean the US requires less industrial goods? Are people in the US no longer interested in gewgaws?

NOT AT ALL

» The consumption of all goods, including industrial goods, are up and up.

» Personal consumption expenditure — the primary measure of what a consumer spends on goods and services, often calculated in what economists call 'nominal dollar terms' — on goods such as vehicles, electronics, food and beverages, clothes, footwear has rabidly increased. 1990 to 2014, up from US $1,500 billion to US $3,950 billion. A 165 per cent increase.

» From all angles, the US today is consuming more than what it did in 2014. But since 'Made in USA' is on a downslide, where is all the stuff coming from? Imports, of course.

Economists also use another metric to understand how much people are consuming. It's called 'real or constant dollar'. It is a measure of purchasing power. In 1990-2014, purchasing power in the US has more than doubled.

» In 1990, the US imported US $500 billion worth of goods. In 2014, US $2,374 billion. Yikes, an almost 5-fold increase.

» In 1990, imported goods made up 33 per cent of the 'basket' of the things a US consumer was spending her/his money on. In 2004, 60 per cent.

LET'S LOOK AT WHAT EXACTLY THE US IMPORTED IN 2014, IN TERMS OF VALUE:

Industrial supplies and materials
28
per cent of all imports

Capital goods except automotive goods
25
per cent of all imports

consumer goods except food products and automative goods
24
per cent of all imports

Vehicles, vehicle parts and engines
14
per cent of all imports

Food products, feed products and beverages
5
per cent of all imports

Today, more than half of all the stuff a US consumer buys comes from outside.

In the last 15 years, imports of **industrial supplies and materials** (cement, steel, chemicals, metals, non-metals and the like) **have tripled**. These are energy-intensive stuff.

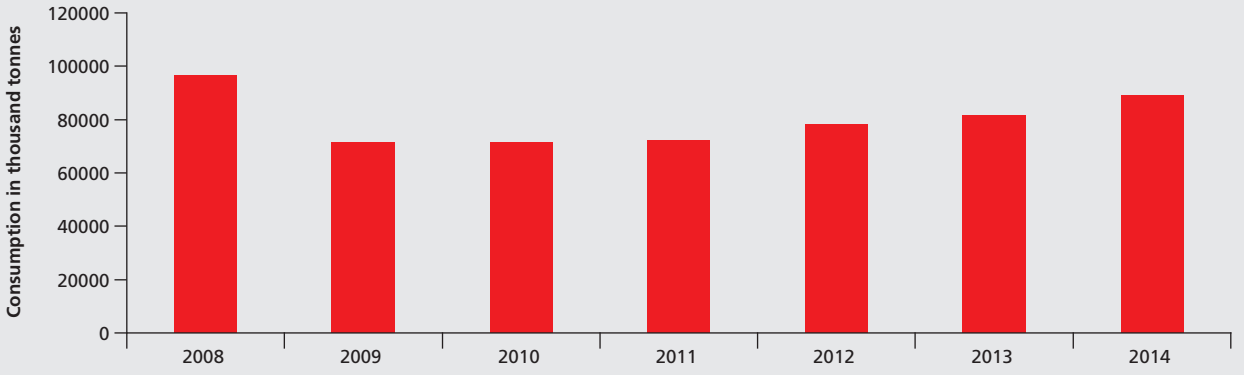
In the last 15 years, imports of **capital and consumer goods have doubled**.

Somewhere, far far away from Plymouth Rock, factories are churning. Furnaces are burning. The smoke spewing out from smokestacks is intense. Why? The US has outsourced a huge proportion of its energy-intensive industrial production.

Sources: Import-export and personal consumption — Bureau of Economic Analysis; energy consumption — USEIA

Graph 6.7: Cement consumption

The US is the world's third largest consumer



Source: Statistics Portal http://www.statista.com/statistics/273367/consumption-of-cement-in-the-us/, as viewed on September 10, 2015.

Table 6.1: Process-related emissions from cement production

Cement manufacturing is very energy-intensive and results in significant energy-related as well as process emissions

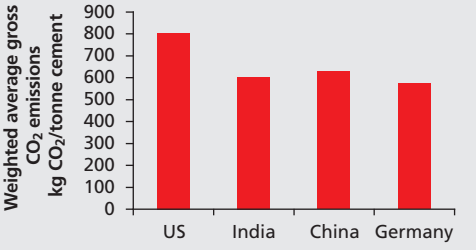
Time	2009	2010	2011	2012	2013
Emissions ($MMTCO_2$)*	29.4	31.3	32.0	35.1	36.1

Source: EPA 2014, US Greenhouse gas inventory report, 1990-2013, http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html, as viewed on September 10, 2015.

** The inventory estimates US process-related emissions from cement production. Due to the nature of the IPCC guidelines, as well as the way industrial sector emissions are estimated in the United States, combustion-related emissions resulting from the cement industry are not as well characterised. One report states that the total combustion and process-related emissions from the cement industry in the US in 2001 itself were 71 $MMTCO_2e$.*

Graph 6.8: Gross CO_2 emissions

The US cement industry is far more emissions-inefficient than its counterparts



Source: World Business Council For Sustainable Development, Cement Sustainability Initiative, GNR Project Reporting CO_2, available at http://wbcsdcement.org/GNR-2012/index.html, as viewed on September 10, 2015.

it is still building more and growing more.

The rise in cement production is directly proportional to emissions increase. Post-slump, CO_2 emissions have also risen, from 29.4 million tonnes in 2009 to 36.1 million tonnes in 2013.

Cement manufacturing results in significant energy-related as well as process emissions of GHGs, mainly CO_2 (see Table 6.1 and Graph 6.8). There are various ways in which GHG intensity of cement production can reduce. Lowering energy intensity reduces emissions. In addition, process CO_2 emissions can be significantly reduced per tonne of cement produced by mixing clinker — limestone — with an increased proportion of other products in cement. The GHG reductions from cement blending can outstrip the returns from energy-efficiency initiatives by a significant margin.[5] But the US cement industry does not seem to have taken to these ways. It is, therefore, far more emissions-inefficient than its counterparts

2.8%

Amount of blended cement used by the US in 2008, compared to 50% by India

in other parts of the world, including India.

Under its 2007 Climate Vision Commitment, the US cement industry has set a voluntary target of 10 per cent reduction, by 2020, over its 1990-level of CO_2 emissions per tonne of product.[6] The industry aims to achieve this goal using a two-pronged strategy: improve energy efficiency by upgrading plants with latest equipment and improve product formulation.

But it can do much more than what it is committed to.

The first, and easiest, is to produce blended cement — Portland cement is replaced with supplementary cementitious material (SCM) — or additives like fly ash. In 2008, the US used only 2.8 per cent of blended cement; such use can be really enhanced. India, for instance, presently uses more than 50 per cent blended cement. The two most commonly used supplementary materials are fly ash from coal-fired power plants and granulated blast furnace slag from pig iron plants.

Currently, the specific energy consumption of US cement plants is pegged at 1,472 kilowatt-hour (kWh) per tonne. Europe stands at 1,139 kWh per tonne on an average, while Japan, with 861 kWh per tonne, has the most energy-efficient cement sector.[7] So, the scope to reduce energy consumption, too, is large.

The target the US cement industry has set is, in short, highly unambitious.

Oil and gas

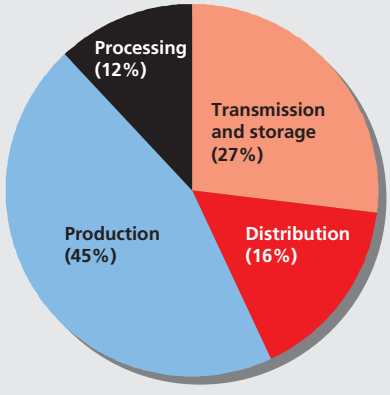
The US oil and gas industry is predicted to grow at a 7 per cent compound annual growth rate, hitting almost US $3,700 billion by the close of 2015, according to research by Market Line, a market research organisation.[8] The US is the world's largest producer of oil and natural gas, overtaking Russia and Saudi Arabia. Till 2010, Russia was the global leader in combined petroleum and natural gas with the US close behind. Saudi Arabia was the largest producer of petroleum till 2012. US and Russia are almost even in natural gas and petroleum production. For Saudi Arabia, natural gas production is marginal.

Emissions from the oil and gas industry are among the largest human-made sources of US methane emissions. Latest GHG emissions data clearly establishes the oil and natural gas sector emits considerably more GHG pollution than previously believed.

On January 14, 2015, the Environment Protection Agency announced a goal to cut methane emissions from the US oil and gas sector by 40-45 per cent from 2012 levels by 2025.[9] The question is: what is going to happen

Graph 6.9: Oil and gas methane emissions

In 2012, this industry was among the largest human-made sources of US methane emissions



Source: EPA 2014, US Greenhouse gas inventory report, 1990-2013, available at http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html, as viewed on September 10, 2015.

US estimates of methane emissions up in flames

Like all other greenhouse gases (GHGs), methane emissions from the oil and gas sector have increased. The Environment Protection Agency's GHG inventory states that the natural gas systems (which include thousands of wells, transmission lines and distribution lines, and processing facilities) contributed to 157.4 million metric tonnes CO_2e of methane. The petroleum system pitched in with about 25 million tonnes of CO_2e. Together, the oil and gas sector contributed to 29 per cent of the US's overall methane emissions.[1]

EPA's numbers for natural gas industry are, by the agency's own admission, outdated, based on limited data and likely to be an under-estimation. Actual emissions would be higher.[2]

The devil is in the detail

The US emits methane from natural gas combusted for energy. But when methane leaks out of oil and gas wells, or pipelines, into the atmosphere, it acts as a potent greenhouse gas. The Global Warming Potential (GWP), an index of how potent a gas is in influencing global warming, is conventionally taken as 25 times that of CO_2, but this is an under-estimation.

The time for which a GHG persists in the atmosphere is also a way to estimate its potency. It is known that CO_2 stays a long time in the atmosphere; methane has a relatively small stay. When averaged over 100 years (to compare with CO_2) its potency is 25, but when averaged over 20 years, its potency could be as much as 105. The jury is still out on this issue and a lot more work needs to be done to estimate its potency and create a methodology to calculate its emissions. This is particularly important in the case of shale gas where gas fields are scattered over long distances. In the case of all natural gas, it is not just about production from a gas field, but also leakage during transportation and during household and industrial use.[3]

First, what is needed is a rigorously established baseline to determine the extent of emissions and the reduction potential. A leading expert on fracture mechanics,Tony Ingraffea of Cornell University, says that the smaller the starting number from which they begin reductions, the smaller the amount one has to reduce in coming years by regulation. A 45 per cent reduction on a rate that is extremely low, for instance, will be a very small reduction. From a scientific perspective, this does not amount to a hill of beans.[4]

Second, how reliable are the EPA figures? To come up with its annual estimate, the EPA does not make direct measurements of methane emissions each year. Rather it multiplies emissions factors, the volume of gas thought to be emitted by a particular source such as a mile of pipeline or a belching cow, by the number of such sources in a given area. For the natural gas sector, emissions factors are based on a limited number of measurements conducted in the early 1990s in industry-funded studies.

In 2010, the EPA increased its emissions factors for methane from the oil and natural gas sector, citing outdated and potentially understated emissions. The end result was a more than doubling of its annual emissions estimate from the year before. In 2013, however, the EPA reversed course, lowering estimates for key emissions factors for methane at wells and processing facilities by 25-30 per cent. Even this is said to be not enough and may still not be the full picture.[5]

Third, the US has consistently downplayed its fugitive methane emissions leakages or gas vented during oil and gas production. A study published in the *Proceedings of the National Academy of Sciences* (PNAS) shows that the US methane emissions may well be a whopping 50 per cent higher than the EPA estimates. Most strikingly, the study reveals that fugitive methane may be five times greater than the current estimates.[6]

Fourth, there have been emissions from abandoned wells. To estimate methane emissions from the oil and gas sector, activities such as production from oil and gas sites, including well completion, routine maintenance and equipment leaks are used to compose a bottom-up estimate. But a comparison of bottom-up and top-down estimates shows that some sources are unaccounted for in the estimates, such as abandoned wells. Currently in the US, there is no regulatory requirement to monitor or account for methane emissions from abandoned wells.[7]

Continued.....

Continued from previous page

Many studies have shown that GHG emissions inventories miss methane emissions from some sources, such as abandoned oil and gas wells, particularly high-emitting wells. These emissions are not accounted for, currently, in any inventory. A study showed that in Pennsylvania alone the emissions from abandoned wells represent 4-7 per cent of the total anthropogenic methane emissions.[8]

Lastly, the powerful oil and gas lobby of the US has claimed methane emissions have reduced, but the devil is in the details. In fact, the EPA study shows that the only point in the natural gas supply chain where emissions have been reduced is in the production phase.[9] The bottom line is that a lot more needs to be done to account for and control methane emissions from the US, particularly in a high natural-shale gas energy future.

if the real emissions from this sector are found to be substantially higher than believed — will this industry then be able to attain its 40 per cent reduction goal?

Iron and steel

In 2013, the world steel industry produced 1.6 billion tonnes of crude steel. In absolute terms, China produced the most, followed by Japan, the US and India.[10]

However, if we look at the per capita apparent steel use — what a country uses minus its exports — then the US, with 333.8 kg per capita, uses more than the world average of 235.9 kg/per capita. At the same time, its usage is much below countries such as South Korea, Taiwan or the Czech Republic.[11] These countries also happen to be huge automobile exporters (see Graphs 6.10-6.12).

Since 1990, the steel industry in the US has reduced its energy intensity by 32 per cent and CO_2 emissions by 37 per cent per tonne of steel shipped.[12] Nevertheless, in 2008, as compared to Japan, the US remained relatively less energy-efficient. Japan's steel sector is 20 per cent more energy-efficient than that of the US. The former is more effcient due to extensive heat recovery equipment and a high rate of utilising by-product gases.[13]

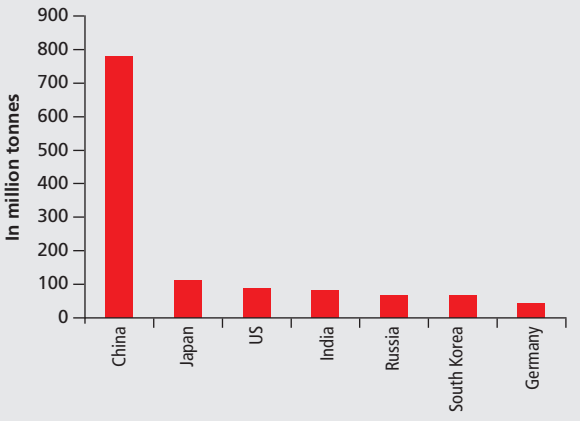
It is estimated that improving the industry's energy efficiency can result in potential CO_2 reduction by 40 per cent in the US.[14] The EU, for instance, has come up with a comprehensive action plan specifically for its steel industry to make it more efficient and reduce costs. The US needs a similar plan.

What is clear is that US industrial sector emissions are not the success story that they are made out to be. For one, emissions may be down but consumption of industrial products is not down. Manufactured goods are used but not produced. Emissions are outsourced. With the availability of cheaper fuel, industry could well move back to the US, leading to a spike in emissions. It is time for US industries to tighten their belt further. Till they do so, the US cannot be a world leader in controlling emissions from its industries.

40%

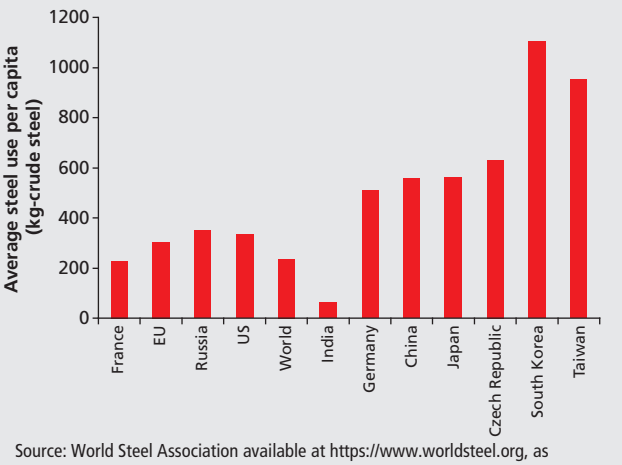
Potential CO_2 reduction that can be achieved if the US steel industry became more energy-efficient

Graph 6.10: Steel production



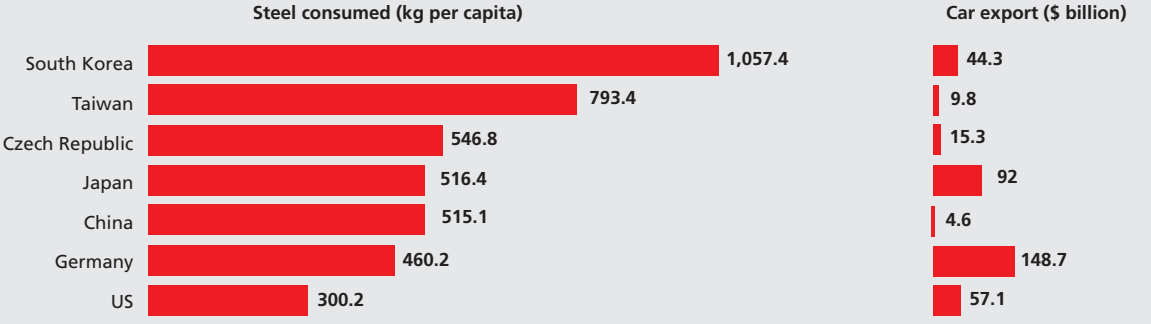
Source: World Steel Association available at https://www.worldsteel.org, as viewed on September 10, 2015.

Graph 6.11: Per capita steel use



Source: World Steel Association available at https://www.worldsteel.org, as viewed on September 10, 2015.

Graph 6.12: Steel consumption versus vehicle exports



Source: Gwynn Guilford 2014, South Korea consumes more steel per capita than China and Japan combined available at Anon http://qz.com/214223/south-korea-consumes-more-steel-per-capita-than-china-and-japan-combined/, as viewed on September 10, 2015.

Table 6.2: Energy consumption — a comparison

	Tonnes of oil equivalent per tonne of crude steel
Japan	0.59
South Korea	0.63
Germany	0.69
France	0.71
United Kingdom	0.72
United States	0.74
Canada	0.75
China	0.76
India	0.78
Australia	0.79
Russia	0.80

Source: RITE 2008, International comparisons of energy efficiency, sectors of electricity generation, iron and steel and cement, Research Institute of Innovative Technologies for the Earth.

Though China and Japan produced more steel than the US in 2013, the US's per capita apparent steel use was more than the world average. However, its usage remained below the big automobile-exporting nations.

The industry has managed to reduce its emissions, but could become more energy-efficient. In 2008, as compared to Japan, the US remained relatively less energy-efficient. Japan's steel sector is 20 per cent more energy-efficient than that of the US.


SORIT
HE WAS RELUCTANT FOR WORKOUTS... THEN WE CHANGED THE DESIGN OF THE TREADMILL

- **Emissions from agriculture were 7.7 per cent of total US greenhouse gas emissions. Since 1990, they have seen a 14 per cent hike.**

- **Methane and nitrous oxide are the primary GHGs this sector emits. The key sources are irrigation, chemical fertiliser use, methane from rice fields, burning crop residues and enteric fermentation.**

- **The US plans to reduce net emissions from this sector and enhance carbon sequestration by 2025; but even after doing all that, its per capita emissions will remain more than that of India.**

- **One important aspect that the US misses out on is the linkage between its agricultural emissions and its consumption of food that is processed and high in empty calories. The way such foods are prepared, and their consumption, adds to the US's climate change burden.**

- **US — and other rich nations — waste a lot of food. In 2010, 60 million tonnes of food was lost to wastage in the US.**

- **Reducing food losses by just 15 per cent would help feed over 25 million people every year, thereby reducing agriculture-related emissions.**

7. Agriculture & Waste

Will the US change its preference for processed foods and stop wasting food?

In 2013, US agricultural emissions were 515 million metric tonnes, accounting for roughly 7.7 per cent of total US greenhouse gas (GHG) emissions (see Graph and Table 7.1). According to the Environmrntal Protection Agency (EPA), emissions from agriculture have increased by roughly 14 per cent since 1990.[1] Methane and nitrous oxide are the primary GHGs this sector emits. The key drivers for emissions growth are livestock manure management and agricultural soil management, and are largely due to irrigation and chemical fertiliser use. Other agricultural sources — methane from rice and burning crop residue — have shown a relatively small increase since 1990. But at 32 per cent, enteric fermentation — gas from the stomach of cattle — remains a high contributor.

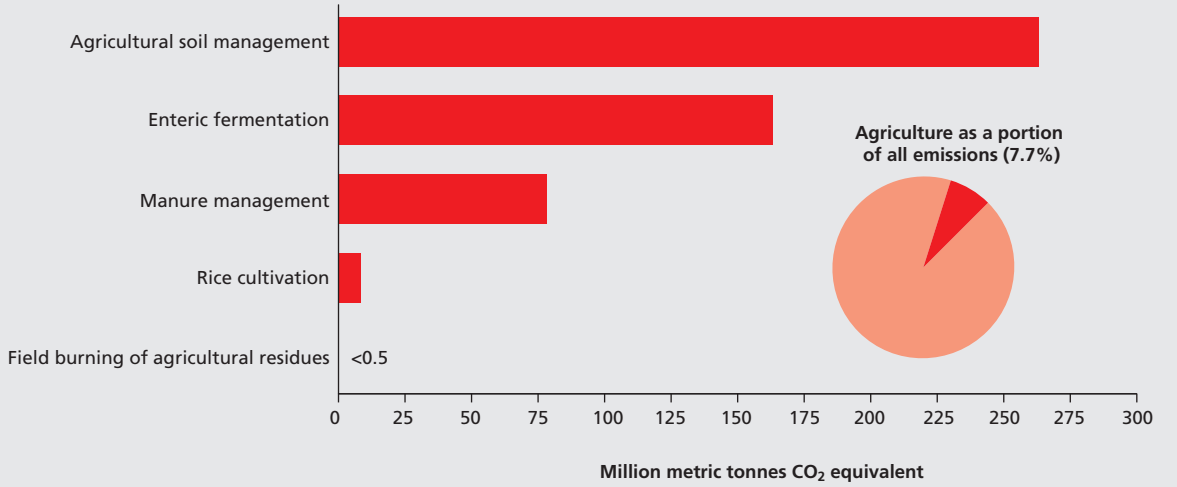
Trends in agriculture source emissions

Methane and nitrous oxide emissions increased by 54.4 per cent from 1990 to 2013, largely from swine and dairy cow manure.[2]

Enteric fermentation is the country's largest anthropogenic source of

Graph 7.1: US agriculture emissions

key drivers for emissions growth are livestock manure management and agricultural soil management



Note: Emission values are presented in CO_2 equivalent mass units using IPCC AR4 GWP values.
Totals may not sum up due to independent rounding.
Source: EPA 2014, US greenhouse gas inventory report, 1990-2013, available at http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html, as viewed on September 25, 2015.

Table 7.1: Emissions from agriculture ($MMTCO_2e$)

Emissions from agriculture have increased by roughly 14 per cent since 1990

Gas/source	1990	2005	2009	2010	2011	2012	2013
CH_4	**210.8**	**234.4**	**242.1**	**243.4**	**238.9**	**239.6**	**234.5**
Enteric fermentation	164.2	168.9	172.7	171.1	168.7	166.3	164.5
Manure management	37.2	56.3	59.7	60.9	61.4	63.7	61.4
Rice cultivation	9.2	8.9	9.4	11.1	8.5	9.3	8.3
Field burning of agricultural residues	0.3	0.2	0.3	0.3	0.3	0.3	0.3
N_2O_2	**237.9**	**260.1**	**281.2**	**281.4**	**283.2**	**283.4**	**281.1**
Agricultural soil management	224.0	243.6	264.1	264.3	265.8	266.0	263.7
Manure management	13.8	16.4	17.0	17.1	17.3	17.3	17.3
Field burning of agricultural residues	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total	**448.7**	**494.5**	**523.3**	**524.8**	**522.1**	**523.0**	**515.7**

Source: EPA 2014, US greenhouse gas inventory report, 1990-2013, available at http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html, as viewed on September 25, 2015.

methane emissions. On a year-to-year basis, emissions increase or decrease depending on the cattle population and what they eat, but overall, between 1990 and 2013 there has been no significant increase. In general, the quantity of gas livestock generate depends on the type — ruminants such as cattle have greater outputs — and quality of feed. Lower quality of feed but also higher feed intake lead to higher emissions. EPA has done extensive work on the methodology to understand feed characteristics and digestibility in livestock. But it accepts that much more is needed to understand methane production from this sector.

Agricultural soils produced 74 per cent of the nitrous oxide emissions in 2013, mainly because of the application of chemical and organic fertilisers and weather and water conditions.

US plans on agriculture

In April 2015, the US agriculture secretary announced the country's plan to reduce GHG emissions from this sector. The plan is to reduce net emissions and enhance carbon sequestration by over 120 million metric tonnes of CO_2 equivalent ($MMTCO_2e$) per year — about 2 per cent of economy-wide net GHG emissions — by 2025.[3] Even then, its per capita emissions will remain more than that of India's (see Box: *Agriculture: per capita emissions*).

The US's broad suite of policies includes targeting livestock-related emissions, by making sure there are roofs to contain some methane emissions, and planting more trees.

Enteric fermentation is the country's largest anthropogenic source of methane emissions

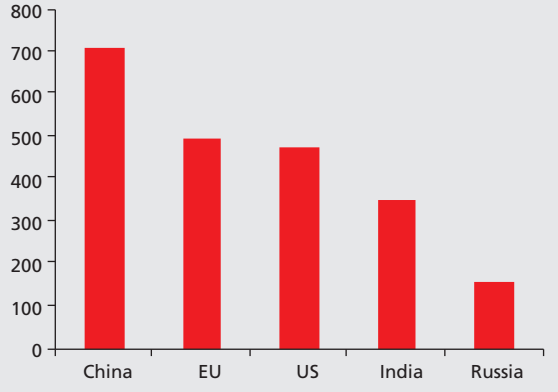
A significant point to note is that this proposed reduction is not solely from reducing agricultural emissions. It also includes new carbon storage in forests and lands, and changes in energy use.[4] Therefore, this percentage would in reality be much lower (see Box: *Forestry and sinks*). There is no target set for each sector, only a list of proposed actions intended to reduce emissions. It is, therefore, difficult to say whether

Agriculture: per capita emissions

It is important to note that in the current climate negotiations, the US is pushing developing countries such as India and China to take up emission cuts in the agricultural sector. A look at the per capita agricultural emissions from a few other developed countries makes it clear that the developed world emits more per capita than developing countries and thus must take the lead in reducing emissions from this sector.

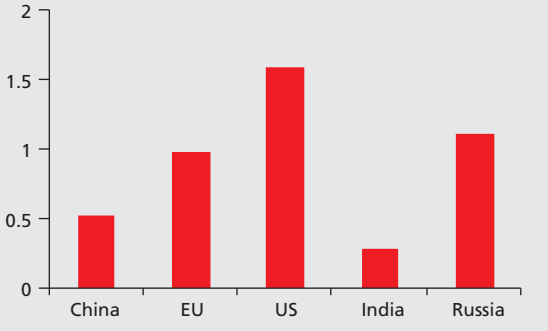
China leads in agricultural emissions; the US stands third after EU-28. However, if we look at per capita emissions, the emerging economies of China and India are only at 0.53 tonnes CO_2e and 0.29 tCO_2e per capita respectively. This implies that the US, with 1.52 tCO_2e per capita, is five times more than that of India and almost three times more than that of China.

Graph 7.2: Comparison of emissions from the agriculture sector



Source: WRI, CAIT 2 Version 2011

Graph 7.3: Comparison of per capita agricultural emissions in different countries



Source: WRI, CAIT 2 Version, 2011

Forestry and sinks

By including land use and forestry as means to implement emission targets, the US might be masking its actual emissions

LULUCF activities in 2011 resulted in a net carbon sequestration of 850 $MMTCO_2e$ which, in aggregate, offset 14 per cent of total US greenhouse gas (GHG) emissions. There are indications that, in the long term, US forest carbon stocks are likely to accumulate at a slower rate than in past decades, and eventually may decline as a result of forestland conversion, the maturation of land that has previously been converted to forests and adverse impacts related to climate change and other disturbances.

Forest management practices, tree planting in urban areas, the management of agricultural soils, and growth in other carbon pools thus become crucial in increasing net uptake (sequestration) of carbon in the US. However, by including land use and forestry as a means to implement its emission targets, actual reduction of fossil fuel end products and consumption-related emission will in fact be much lower. It is clear that the methodology for measurements must improve so that actual emissions are not masked.

US intended action for agriculture emissions

The US government has announced 10 building blocks that span a range of technologies and practices that will reduce greenhouse gas emissions, increase carbon storage and generate clean renewable energy.

Soil health: Improve soil resilience and increase productivity by promoting conservation tillage and no-till systems, planting cover crops, planting perennial forages, managing organic inputs and compost application, and alleviating compaction. For example, the effort aims to increase the use of no-till systems to cover more than 100 million acres by 2025.

Nitrogen stewardship: Focus on the right timing, type, placement and quantity of nutrients to reduce nitrous oxide emissions and provide cost savings through efficient application.

Livestock partnerships: Encourage broader deployment of anaerobic digesters, lagoon covers, composting, and solids separators to reduce methane emissions from cattle, dairy, and swine operations, including the installation of 500 new digesters over the next 10 years.

Conservation of sensitive lands: Use the Conservation Reserve Program (CRP) and the Agricultural Conservation Easement Program (ACEP) to reduce GHG emissions through riparian buffers, tree planting, and the conservation of wetlands and organic soils. For example, the effort aims to enroll 400,000 acres of lands with high greenhouse gas benefits into the Conservation Reserve Program.

Grazing and pasture lands: Support rotational grazing management on an additional 4 million acres, avoiding soil carbon loss through improved management of forage, soils and grazing livestock.

Private forest growth and retention: Through the Forest Legacy Program and the Community Forest and Open Space Conservation Program, protect almost 1 million additional acres of working landscapes.

Stewardship of federal forests: Employ the Forest Stewardship Program to cover an average of 2.1 million acres annually (new or revised plans), in addition to the 26 million acres covered by active plans. Reforest areas damaged by wildfire, insects, or disease, and restore forests to increase their resilience to those disturbances. This includes plans to reforest an additional 5,000 acres each year.

Promotion of wood products: Increase the use of wood as a building material, to store additional carbon in buildings while offsetting the use of energy from fossil fuel.

Urban forests: Encourage tree planting in urban areas to reduce energy costs, storm water runoff, and urban heat island effects while increasing carbon sequestration, curb appeal, and property values. The effort aims to plant an additional 9,000 trees in urban areas on average each year through 2025.

Energy generation and efficiency: Promote renewable energy technologies and improve energy efficiency. Through the Energy Efficiency and Conservation Loan Program, work with utilities to improve the efficiency of equipment and appliances. Using the Rural Energy for America Program, develop additional renewable energy opportunities. Support the National On-Farm Energy Initiative to improve farm energy efficiency through cost-sharing and energy audits.

Source: USDA 2015, Secretary Vilsack announces partnership with farmers and ranchers to address climate change, US Department of Agriculture available at http://blogs.usda.gov/2015/04/23/secretary-vilsack-announces-partnerships-with-farmers-and-ranchers-to-address-climate-change/, as viewed on September 25, 2015.

these actions, on their own or together, will bring change or whether agriculture emissions will be masked by an increase in sequestration — land use and forestry changes that absorb the pollution.

What is interesting is that the US does not, in any way, link its agricultural emissions to its consumption of 'intensively' grown food; its sheer wastage of Planet-costing food and its poor health status, with the result that it is eating food that is processed and high in empty calories. This is its agenda — link food with nutrition and nature.

Livestock emission-consumption link

The bulk of US agricultural emissions is related to its livestock industry. What is the US doing to reduce these emissions? Currently, the 10 aspects of its domestic action plan are aimed, at best, to mitigate emissions through after-treatment devices, like anaerobic digesters (biogas plants).

But it says nothing about how it must change the way it produces food and even change what it eats. Meat consumption in the US has nearly doubled in the last century. According to the Food and Agriculture Organization, an American eats more than three times the global average.[5]

This consumption has health impacts — eating meat that is high in saturated fat means even the 'goodness' of protein is negated. Americans eat more than 1.5 times the average human protein requirement.[6] It is now well documented that excess meat consumption is linked to the burden of diseases of the heart, type 2 diabetes, obesity and certain cancers.

Then there is the added problem of the way meat is 'produced', which uses intensive methods and feeds animals additives and antibiotics. All this adds to pollution in the country's waterways and has led to serious problems of antibiotic resistance. In the 2015 national dietary guidelines, for the first time, concern regarding environmental and health impacts have led to a proposal to restrict meat consumption. But the country's powerful meat industry opposes any such move.[7] Reduction in meat-eating and changes in the way it is produced must be a central part of the country's climate change mitigation plan. As yet, these solutions are being ignored.

Food waste: not counted yet

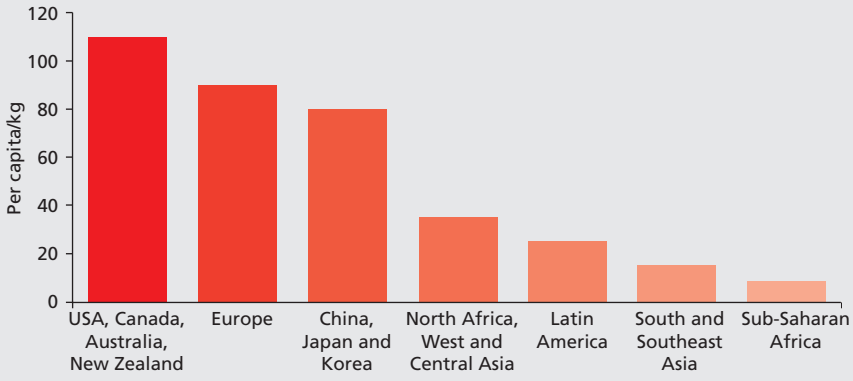
Agriculture emissions are not just about what is produced or how it is produced. It is also about how what is produced is wasted. Wastage of food is about inefficiency. Every year, according to United Nations Environment Programme (UNEP), consumers in rich countries waste almost as much food (222 million tonnes) as the entire net food production of sub-Saharan Africa (230 million tonnes).[8] In the US, 60 million tonnes of food was lost in 2010. This amounts to 31 per cent of the total food supply, worth about US $161.6 billion.[9] The wastage translates to 141 trillion calories down the drain, literally, or 1,249 calories

31%

of the US's total food supply was wasted in 2010 — amounting to a loss of over US $161 million

Graph 7.4: Annual food waste by region

Richest nations waste 110 kg every year; the poorest, less than 10 kg



Source: FAO 2011, *Global food losses and food waste: extent, causes and prevention*, Rome

per capita per day. According to the US Department of Agriculture (USDA), the top three food groups lost in 2010 were dairy products (19 per cent of all the lost food), vegetables (19 per cent) and grain products (14 per cent).[10]

The per capita wastage of food is much higher in developed countries than in developing and poor countries. In countries such as the US and Canada, each person wastes about 110 kg of food annually; in sub-Saharan Africa, it is less than 10 kg per person. The figure rises to 80 kg per person per year in the case of China, Japan and Korea (see Graph 7.4: *Annual food waste by region*).[11]

According to a 2012 report by the National Resources Defence Council (NRDC), a staggering 40 per cent of total food in the US goes uneaten. When the resources to grow that food are considered, this amounts to approximately 25 per cent of all freshwater, 4 per cent of the oil the US consumes and more than US $165 billion dollars dedicated to producing food — which is never eaten. The average American throws away between US $28 to US $43 in the form of about 9 kilograms of food each month.[12]

In this way, says the NRDC, the average American consumer wastes 10 times as much food as someone in Southeast Asia. The waste trend is up by 50 per cent in the 1970s. Over decades, wastage has only increased. Reducing food losses by just 15 per cent would provide enough food to feed more than 25 million Americans every year at a time, thereby reducing its agriculture-related emissions.[13] Moreover, almost all of that uneaten food ends up rotting in landfills, where organic matter accounts for 16 per cent of US methane emissions.

40%

of total food in US goes uneaten — US $165 billion is spent on producing this food

The carbon footprint of wasted food is calculated based on emissions from different stages of production — growing food, pre-production,

post-production and deforestation. It then turns out that the consumer waste footprint is more than 350 kgCO_2e in North America, while it is 25 kgCO_2e in sub-Saharan Africa.[14]

There is also a difference in where this waste occurs. In poor countries, food wastage happens not out of choice but because of lack of infrastructure and facilities to store food. In many cases farmers have no option but to allow the waste to happen, but even there all efforts are made to save and re-use wasted food. In rich countries, however, waste happens after food is produced and because consumers throw food away.

Globally, cutting food waste levels by half would save the world up to US $300 billion by 2030. At the same time, emissions would fall by up to 1 billion metric tonnes of CO_2 emissions per year, equal to roughly one-seventh of all US GHG emissions. In the US alone, an average family could save around US $1,600 a year by eating leftovers and by smart shopping.[15]

What is being done to control food wastage? In January 2012, the European Parliament adopted a resolution to reduce food waste by 50 per cent by 2020 and designated 2014 as the 'European year against food waste'. In the UK, through a massive public campaign called 'Love Food, Hate Waste', in just five years, avoidable household food waste has been reduced 18 per cent. Likewise, in Japan, targets were put in place in 2012 to curb wastage. As a result, food waste there has reduced by around 14 per cent over a 3-year period. In Denmark, 50 per cent of the population reduced food waste within a year in 2012.[16]

But in the US, there is no drive to push for changes in consumer behaviour so that food wastage is reduced:

- The US, like the UK, needs a massive public campaign to educate people about food wastage and to instil food conservation habits.
- Across supply chains, the US needs tight regulations to ensure food wastage is minimal.

Just Bin It

To reduce emissions in the agricultural sector, the US focuses on areas such as soil management, rice cultivation and manure management. It even has the wisdom to focus on enteric fermentation—the fart of a calf, a heifer, a bull or a cow.

But it does not have the wisdom to focus on food wastage

In 2010, the US 'lost' 60 million tonnes of food. 31 per cent of that year's food supply. Worth US $161.6 billion. 'Lost' means 'thrown away, just like that'. Literally, that year 141 trillion calories—or, 1,249 calories per person daily—went down the drain.

They were sent down the drain. According to a 2012 report of US-based think tank National Resources Defense Council (NDRC), 40 per cent of all food the US has goes uneaten.

Consider: what were the resources used to produce the 40 per cent food uneaten?

- 25 per cent of all freshwater (in the US?)
- 4 per cent of all the oil the US consumes
- US $165 billion spent in putting this food on a table

An American throws away, on average, 9 kg of food per month. Worth US $28-US $43. It ends up in landfills and rots. The landfill emits methane. No surprise, then, that organic matter accounts for 16 per cent of all US methane emissions. Methane is a deadlier greenhouse gas than CO_2.

SAYS THE NDRC REPORT

- **An American consumer wastes 10 times what someone in Southeast Asia wastes**
- **The carbon footprint of food wastage an American indulges in is 350 $kgCO_2$-equivalent. In Sub-Saharan Africa, it is 25 $kgCO_2$-e.**

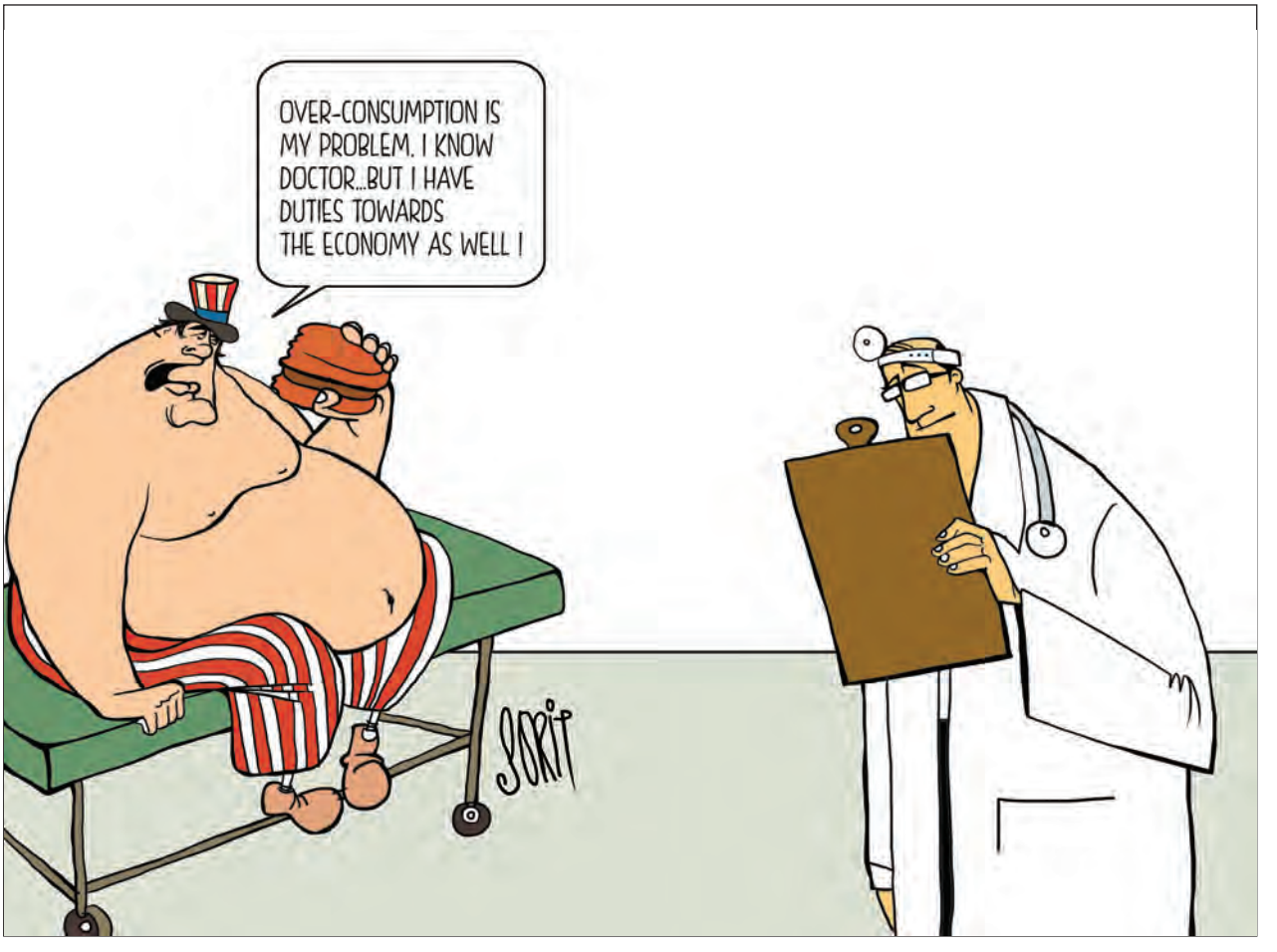
OTHER NATIONS ARE CLAMPING DOWN ON FOOD WASTAGE:

- In January 2012, the European Parliament adopted a resolution to reduce food waste by 50 per cent by 2020. It designated 2014 as the 'European year against food waste'.
- The UK did a massive campaign against wasting food. In 5 years, food wasted by households reduced 18 per cent.
- In 2012, Japan created a target to curb wastage. There, over 3 years, food wastage has reduced 14 per cent.
- In 2012, in Denmark, 50 per cent of Danes reduced their food wastage.

But the US doesn't care about food wastage. The consumer there is supreme.

Globally, if food waste levels are halved, the world would save up to US $300 billion by 2030.

But the US doesn't care. The consumer there is truly supreme.


OVER-CONSUMPTION IS MY PROBLEM. I KNOW DOCTOR...BUT I HAVE DUTIES TOWARDS THE ECONOMY AS WELL !
SORIT

- **The US's consumption levels are mind-boggling. In 2013, a US household purchased items which were double that of the EU, 24 times that of China, and 44 times that of India.**

- **On an average, an individual in the US today consumes 50 per cent more goods and services than in 1990.**

- **US citizens are spending less than half their consumption expenditure on basic things like food, energy and transport, and much more on non-essential services and goods related to areas like communication, recreation, clothes and personal care etc.**

- **In market exchange rate terms, average per capita consumption in the US is 36 times higher than India's. An average American spends 15 times more on food, 50 times more on housing, and over 6,000 times more on recreation.**

- **The US does not have a deliberate policy to reduce its consumption of primary energy or goods and services.**

8. The Mall-thusians

A species bred on conspicuous consumption. Borne by the USA

'Consumption' is a conspicuously 'bad' word in climate change discussions. It is accepted consumption of goods and services require energy, which leads to emissions. Further, it is accepted consumption patterns must change, so that there is human well-being, though not at the cost of the Earth. This line of argument presumes a silence that has achieved axiomatic status: don't mention 'consumption'. The silence is founded on a great faith that consumption is nothing less that the New Global Sermon on the Mount (NGSM), to be endlessly recited, word for word. Critiquing NGSM is taboo, for then we delve into the realm of how the market needs to be reined in; that's socialism: unacceptable. In this way, global negotiations on climate change dish out mouthfuls of proper platitudes about consumption patterns and all that goods and services jazz, but have no real take on what is the lifestyle the Planet can sustain.

In the US, where there are enough critics of the very idea of climate change, NGSM rules absolute. The US government does not ever broach it. Even the big US groups, powerful in Washington and global circles, do not want to discuss it at all. Whereas 'consumption' is on, really on, it is never on the table. Any table.

But we need to break the silence. It may be inconvenient, but this bad word is far too important to ignore.

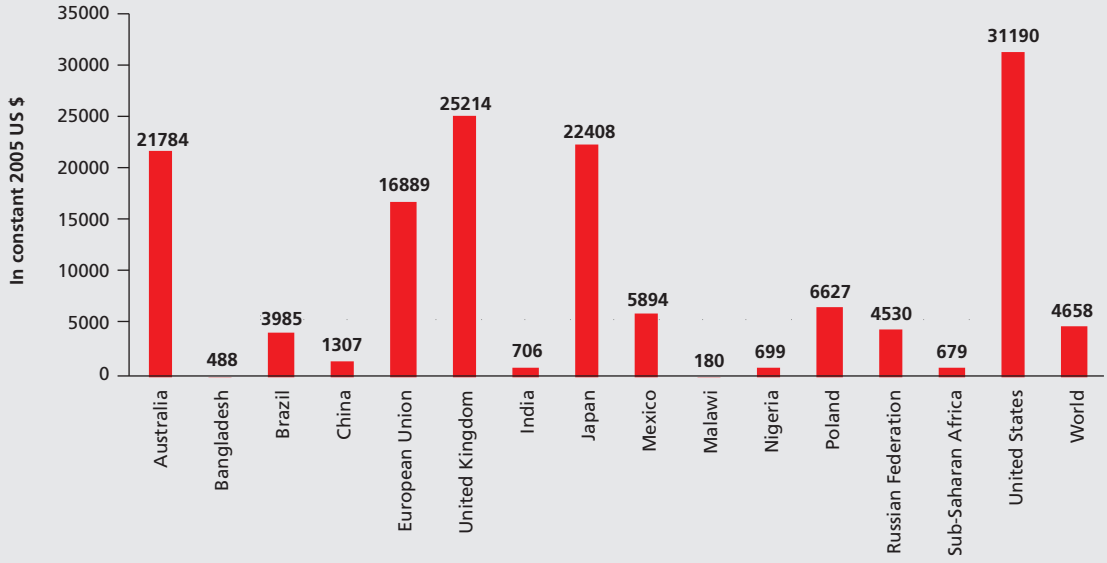
Absurd levels

The way the US gobbles up goods and services is unparalleled in the world. It has the highest per capita household final consumption expenditure (a measure of consumption, calculated as the market value of all goods and services a household purchases in a year). In 2013, all the stuff a US household purchased was almost double that a European Union household did, 24 times a Chinese household, 44 times an Indian, 64 times a Bangladeshi household and 173 times a household in Malawi. That year, per capita household final consumption expenditure (constant 2005 US $) was 6.7 times the world average (see Graph 8.1: *Household final consumption expenditure per capita: 2013*). Even in 1990, household spend in the US was US $21,000 (constant 2005 US $) — it took the Germans 20 more years to match that level.

There really isn't no mountain high enough. Since 1990, the index of total real personal consumption expenditure — a measure of goods and services targeted towards individuals and consumed by them — in the US has almost doubled. The index has increased by about 120 per cent for goods and 80 per cent for services. In terms of value, therefore, the US has almost doubled its total consumption of goods and services since 1990

Graph 8.1: Household final consumption expenditure per capita: 2013

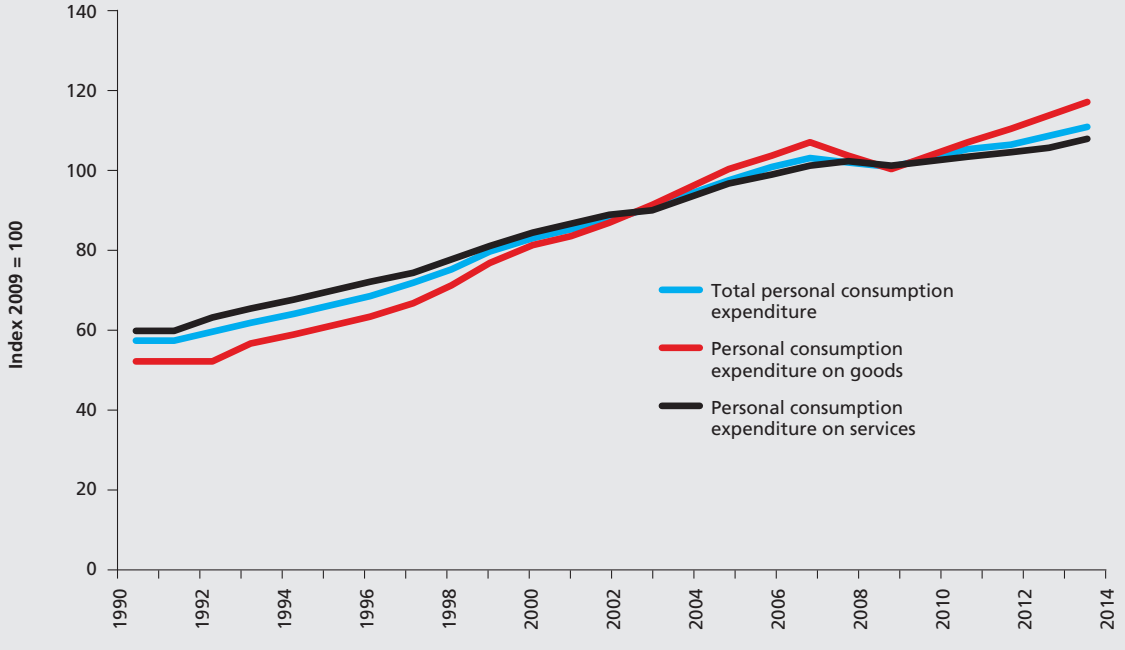
The US has the highest — 44 times that of India's



Source: Household final consumption expenditure per capita (constant 2005 US $), World Development Indicators, World Bank

Graph 8.2: Index of real personal consumption expenditure

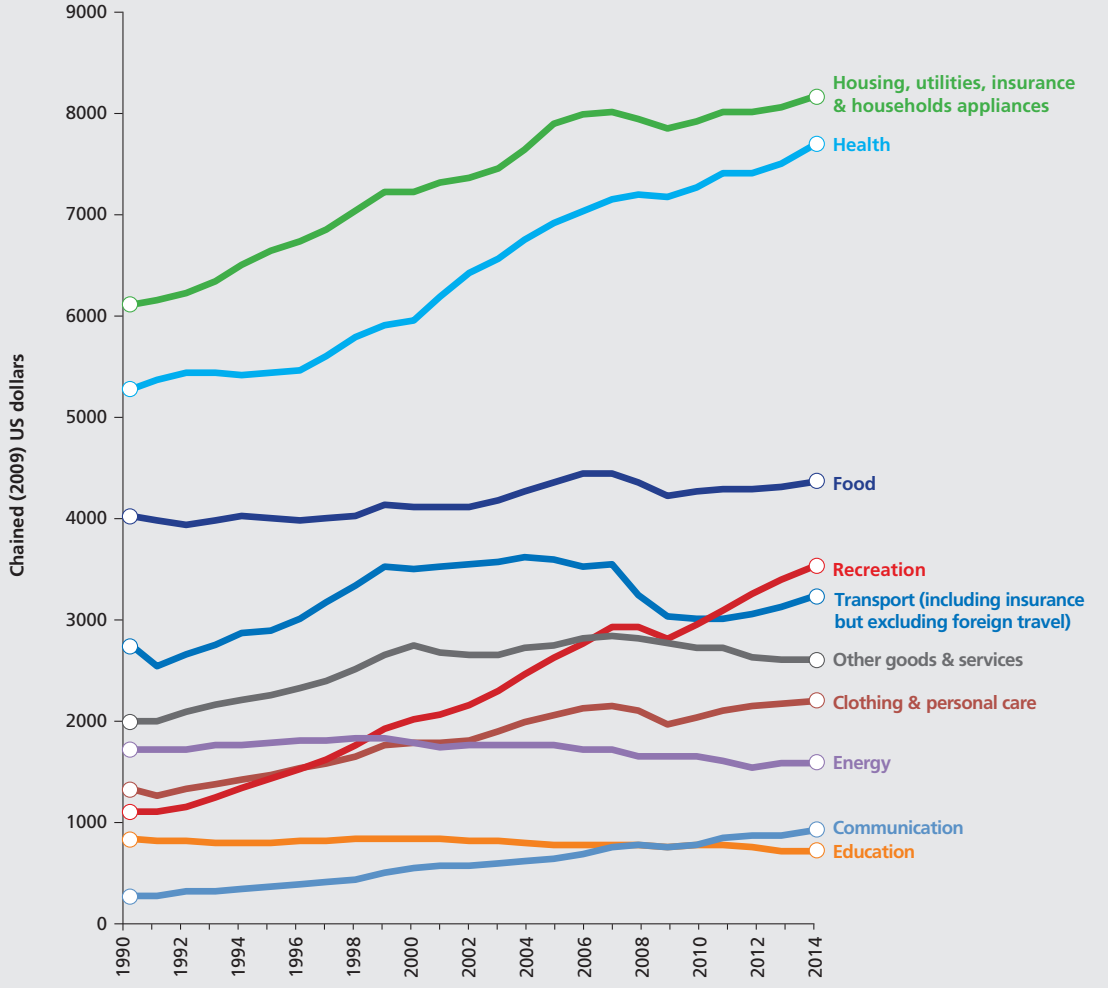
The index has doubled since 1990



Source: Graph generated by Centre for Science and Environment based on data from personal consumption expenditure, 1969-2014, Bureau of Economic Analysis

Graph 8.3: Per capita real consumption expenditure by function

Individual spend has annually grown 1.7 per cent in the last 24 years



Source: Graph generated by Centre for Science and Environment based on data from personal consumption expenditure, 1969-2014, Bureau of Economic Analysis

(see Graph 8.2: *Index of real personal consumption expenditure*).

Per capita real personal consumption expenditure (in 2009 dollars) — what a person spends on consumables, measured in terms of a constant, here the value of a dollar in 2009 – in the US also grew from US $22,739 in 1990 to US $34,108 in 2014, an increase of 50 per cent. On average, then, an individual in the US today consumes 50 per cent more goods and services than what s/he did in 1990. Individual spend has annually grown 1.7 per cent in the last 24 years (see Graph 8.3: *Per capita real consumption expenditure by function*).

More absurd

The gobble-picture is not surprising at all. Even as the world was meeting in the city of Rio De Janeiro, in June 1992, to discuss how it could

+220%

the growth in an American's consumption expenditure in goods and services related to recreation

mitigate greenhouse gas emissions, the then US president George Bush Sr was strolling in malls in his country, extolling his people to consume more to save the failing economy. Americans have taken his message to heart. And keep it there, whether the economy's failing or not.

What is an average American today spending more on? Americans are changing the way they consume different products and services. First of all, even at such a high level of consumption, consumption expenditure is increasing for all goods and services other than two areas.

There has been but a modest increase, 1990-2014, in what Americans spend on food and beverages: about 8 per cent. Over this period, expenditure on housing and transport has increased, respectively 30 per cent and 17 per cent. Americans continue to buy more cars and bigger houses.

The only two areas in which individual spend has actually fallen are education and energy, by 15 per cent and 8.5 per cent respectively. The former is a surprise. The fall in energy spend is perfectly explainable. An American's spend on energy has fallen, but the energy s/he consumes has increased: that's only possible when real energy prices dip.

In this way, an average American is spending less on the basket of what may be called 'basic necessities' or 'essential items', as compared to non-essential luxury items.

The maximum growth in an American's consumption expenditure has occurred in goods and services related to communication (+250 per cent) and recreation (+220 per cent). Spending has also spiked on household furnishing and equipment (+90 per cent), clothes and personal care (+70 per cent) and heath care (+46 per cent).

Thus, an 'individual' in the US today spends less than half his/her annual consumption expenditure on basics such as food, energy, housing and transport. Consumption growth in the US is, therefore, propelled by services and non-essential luxury consumption.

Totally absurd

The real absurdity of US consumption levels becomes apparent as soon as what Americans consume is compared to what citizens of some other countries do. In this context, the Centre for Science and Environment (CSE) has compared average American consumption with average consumption by a citizen of India. The years for which CSE has complete data to enable such a comparison is for 2011-2012 (see Table 8.1: *Average per capita consumption expenditure in the US and India*).

There is absolutely no comparison between the consumption expenditure of an average American and an average citizen of India. In market exchange rate (MER) terms, the average per capita consumption expenditure in the US is 36 times higher than India's (US $33,469 vs US $900). Even in terms of purchasing power parity (PPP), the average per capita consumption expenditure in the US is 10 times higher than India's (US $33,469 vs US $3,001).

Scarfheads

The consumption of goods and services is highest in the US

What is a US citizen consuming more of today?

1990-2014, on basic necessities, an American's spend is more or less the same. What s/he is spending more on – really, really more – are the kinds of goods and services that can only be called non-essential.

Basic necessities (1990-2014)

8 per cent more
A moderate increase
Food and beverages

30 per cent more
Bigger homes
Housing

17 per cent more
More cars
Transport

15 per cent less
Surprising
Education

8.5 per cent more
Prices are down, consumption is up
Energy

In 1990, an American spent US $22,739 on goods and services. In 2014, s/he spent US $34,108 – an increase of 50 per cent in the last 24 years. An individual in the US today consumes 50 per cent more goods and services than s/he did in 1990.

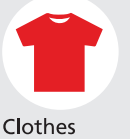
Non-essential spending (1990-2014)

250 per cent more
Really?
Communication

220 per cent more
Run away!
Recreation

90 per cent more
Wow
Household furnishing

90 per cent more
Toast!
Household appliances



70 per cent more
Haute!
Clothes

70 per cent more
Ooh.
Personal care

46 per cent more
Its OK.
Health care

Source: Inforraphics by Centre for Science and Environment based on data from Personal consumption expenditure, 1969-2014, Bureau of Economic Analysis.

Table 8.1: Average per capita consumption expenditure in the US and India

In market exchange rate terms, the US's is 36 times higher than India's

	Average per capita consumption expenditure			India vs. USA	
	United States: Average 2011 & 2012	India: 2011-12		US consumption as number of times India's consumption	
	($US)	($US-MER)	($US-PPP)	($US-MER)	($US-PPP)
Food, beverages & tobacco	5160	324	1079	15.9	4.8
Clothing, footwear, and related services	1158	67	223	17.3	5.2
Housing & household goods & services	7827	154	512	51.0	15.3
Health	7099	33	109	216.8	65.0
Transportation	3447	142	474	24.2	7.3
Communication	828	12	39	70.2	21.1
Recreation	3021	0.5	2	6173.4	1852.0
Education	829	24	79	35.0	10.5
Other goods and services	4099	145	484	28.3	8.5
Total per capita household consumption expenditures	33469	900	3001	37.2	11.2

Notes:

1. CSE has harmonized data of both the countries, for classification of goods and services are not identical. We also had to average consumption data for two years for the US (2011 and 2012) because India's consumption data is for the period April 2011 to March 2012.
2. Indian rupee has been converted to US dollar using the annual average market exchange rate (MER) published by the Reserve Bank of India. For the year 2011-12, the average exchange rate of a US dollar to an Indian Rupee was 47.9229. The US $ (MER) was converted to US $(PPP or purchase power parity) using the data published by the World Bank on Price level ratio of PPP conversion factor (GDP) to MER. For 2011-2012, the conversion factor for India was 0.3.
3. Data on household consumption expenditure is published as part of National Accounts each year. This data gives the total private consumption in a country under different categories of goods and services. Bureau of Economic Analysis (BEA) in the US and the Ministry of Statistics and Programme Implementation (MOSPI) in India publish annual data on total household consumption expenditure. CSE has taken this data and converted them in per capita terms using estimated total population of both countries.

In MER terms, an average American spends 15 times more on food and beverages, 24 times more on transportation, 50 times more on housing and household goods & services, more than 200 times on health, and more than 6,000 times on recreation as compared to an average Indian.

Even in terms of PPP, the consumption in the US is extremely high compared to India.

The situation begs some very important questions: Is there a limit to consumption? How much consumption is enough? Can the US continue to increase its consumption and still continue to reduce greenhouse gas emissions?

There is no visible trend to indicate the US has in place a deliberate policy to reduce primary energy consumption and reduce consumption of goods and services. There is no sign of the breakthrough the world is looking for from the 'indispensible nation'. The Mall-thusian is in the US' climate-action vanguard, possibly leading it. He is invisible, omnipotent and chilling-out. In the final analysis, that's what is really chilling about this country's climate-action claims.


DON'T FIGHT FOR THIS PLANET
YOU HAVE TOO MANY OPTIONS
OVER THERE !

9. The Star-Spangled Spanner

What this book is about. A reiteration

The minimal context for this book is the Intended Nationally Determined Contribution (INDC) the US has submitted to the secretariat of the United Nations Framework Convention on Climate Change. We seek clarity. We need adequacy. So we ask: is the US submission ambitious and equitable, as the INDC claims? Does the INDC reflect the country's intention to reduce emissions over time, really reduce in real time? Is this the beginning of the change the world so desperately seeks from the US?

There is a larger context. The Planet has run out of time and carbon space. Climate change impacts are already devastating large parts of the globe — the poorest, the most vulnerable, are worst-hit. In large parts of the Indian subcontinent and in Africa, farmers face increasing insecurity as weather patterns change and rainfall anomalies become the new normal. Increasingly, we are witness to season after season of despair. Sowing time or harvesting time or anytime in the middle, the weather turns 'weird', destroying crops. Taking life. Now the weather deals out death, impacting everybodu, not just the poor. Today, the signs of what the future holds are clear.

President Barack Obama was right when he said, in August 2015 in Alaska, that "Climate change is no longer some far-off problem; it is happening here, it is happening now." The world, therefore, has to get its act together, to cut emissions at a pace and a scale needed to keep Earth safe. The US, the largest historical contributor of greenhouse gases and the second largest polluter to date, is a big piece of the global climate change challenge.

Ambition and equity?

We conclude: the INDC of the US is neither ambitious nor equitable. Most importantly, in the existing as well as the expected global climate change regime, the US will not compromise on the way it eats into the global carbon budget. It will continue to appropriate, as disproportionately as before, the global carbon space.

In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change published a carbon dioxide (CO_2) emissions budget — how much CO_2 the world could emit to stay below 2°C warming. It estimated the world could emit about 2,900 billion tonnes (giga-tonne or Gt) of CO_2 from all sources, from the dawn of the Industrial Revolution till 2100, to avoid catastrophic change.

But by 2011, the world had emitted 1,900 Gt of CO_2. Over 65 per cent of the global atmospheric commons has already been used up. All that remains, 2012 to 2100, is 1,000 Gt. This is the shrunken carbon space that must be divided between nations in the future. In a context where no country, as yet, has been able to delink growth from CO_2 emissions, a question emerges: who has already emitted in the past — appropriated the carbon space — and who now has the right to use that little space in order to develop?

The US, 1850-2011, emitted 411 Gt CO_2 (after accounting for emissions removed by its terrestrial sinks). With roughly 5 per cent of the world's population, it has emitted 21 per cent of the world's total CO_2 till 2011. What is it now doing to vacate that space, reduce its emissions so that other countries can grow?

Quite frankly, nothing.

The INDC of the US, which promises to reduce emissions by 26-28 per cent below 2005 levels by 2025, shows the US is planning to appropriate another 80 Gt CO_2. By 2025, then, the US will use roughly 500 Gt of the total 2,900 Gt carbon budget available to all countries till 2100. 1850-2100, therefore, it will eat into 17.25 per cent of the global budget. That's not fair. Not by a long shot.

Also, the US will not stop its emissions in 2025. In fact, in 2025 its total GHG emissions will be 4,765 Gt CO_2e. Its per capita emissions are going to be 13.5 tonnes. In comparison, the EU has committed to reduce 40 per cent below 1990 levels by 2030. This means in 2025 the per capita emissions of the EU will be 6.5 tonnes — less than half of the US. So, the US INDC is also not ambitious. Not by a longer shot.

Beginning to change?

The US is not ambitious. Its INDC is not equitable. Still, we ask: does the submission herald the beginning of the change the world is so desperately seeking from the US?

The US civil society argues that even if the INDC is not ambitious, it does signify the country has taken the first step to reduce its gargantuan emissions. More importantly, regulatory measures it is now taking will ensure its emissions continue on a downward spiral. The message is: the US is on track. Climate action has gathered momentum and the future will be different. This is why the US wants, at the forthcoming climate conference in Paris, COP-21, to sign off on a post-2020 emissions

Table 1: Misappropriating Carbon Budget

Total carbon dioxide budget (Gt)	US emitted up to 2011 (Gt)	US will emit by 2025 (Gt)	Total between 1850-2025 (Gt)	% of world's total carbon budget by 2025
2900	411	80	491	17.25

Source: Centre for Science and Environment

reduction agreement. Such an agreement, the US insists, will create a stable regime, in which all countries will have a pledge to keep, a pledge that can be reviewed periodically and ratcheted up slowly.

The question here is: has the US indeed put into place measures that will increase its ambitions in the future?

We conclude: There is no evidence of a policy-driven downward trend in US GHG emissions post-2005 (2005 is the year US emissions peaked). In fact, as the economy is picking up, so is consumption and consequently emissions.

It is true that US GHG emissions are lower in 2013 than 2005, but we see no relation between such reduction and regulatory actions that will enable long-term change. In 2013, as the economy picked up, emissions increased by 2 per cent over the previous year. The US Environmental Protection Agency (EPA) itself accepts that this upward trend is because of "increased emissions from electricity generation, an increase in miles travelled by on-road vehicles, an increase in industrial production and emissions in multiple sectors and year-to-year changes in the prevailing weather" (see Box: *What the watchdog found*).

- Emissions from all sectors, barring the industrial sector, are higher in 2013 compared to 1990 levels. There was a recession-led dip in emissions 2007 on, but emissions are climbing up again as the economy continues to recover;
- Industrial sector emissions, 1990-2013, are lesser largely because the US has outsourced manufacturing and production of goods. In this period, consumption of goods has skyrocketed; imports of goods, particularly energy-intensive industrial supplies, have surged. Therefore, this cannot be counted as a 'reduction'.
- Emissions from cars, which contribute 42 per cent to the US transport sector's emissions, are increasing. 2005-2013, emissions from the sector as a whole have annually reduced, by 1.4 per cent. But emissions from passenger cars have increased 1 per cent. 2014 on, car sales are up and are expected to break new records. With the price of motor gasoline (petrol and diesel) remaining low, there is no reason to believe this trend will be reversed.

We conclude: All US climate change action plans, domestic as well as the INDC, are business-as-usual. They are not turning the economy low-carbon.

The Clean Power Plan (CPP) finalised in August 2015, the country's single biggest measure to reduce emissions from power plants, is neither ambitious nor historical. At best, it can be called 'business-as-usual'.

- Under this plan, the objective is to reduce CO_2 emissions from the power utility sector — 32 per cent, by 2030, below 2005 levels. But this plan only reflects what is already happening in the US energy sector. Market economics, not climate change considerations or policy, rule.

What the watchdog found

The truth about US emissions, year-on-year

The Environmental Protection Agency (EPA) of the US has published an inventory of US greenhouse gas emissions. A remarkable piece of documentation, the inventory provides a candid picture of exactly what has been going on in the US. Among other revelations, the inventory nails the lie about US emissions reduction since the 2005 'peak'.

EPA explains the year-to-year changes in emissions in the US in recent years[1]:

- **2009-2010: Emissions from fossil fuels increased by 3.3 per cent, the largest annual increase in CO_2 emissions for the 24-year period from 1990 to 2013. It was due to increase in economic output, higher coal consumption and the hot summer of 2009.**
- **2010-2011: Fossil fuel emissions decreased by 2.5 per cent. A rise in natural gas use and higher car fuel costs, which led to lesser miles travelled, were the reasons. A significant increase in gasoline price led to 1.2 per cent lesser energy consumed. In addition, the price of coal was up while gas prices went down; that led to a 5.7 per cent decrease in coal used to generate electricity and a concomitant 2.5 per cent increase in natural gas use. Though a fossil fuel, gas has lower carbon intensity. Its use produces lesser emissions. Hence the dip.**
- **2011-12: Emissions from fossil fuels decreased 3.9 per cent, primarily because of a switch from more expensive coal to cheaper natural gas. Coal consumed to generate electricity reduced 12.3 per cent; gas use increased 20.4 per cent. Weather conditions, in addition, were good. So heating-degree days — days below or above 65° F (18°C) — decreased by up to 12.6 per cent. People used less energy to heat or cool their homes, and so natural gas consumed in the residential and commercial sectors was down roughly 20 per cent. Thus, it was a shift to relatively cleaner gas and its lesser use that gave the US the opportunity to boast about cleaning up.**
- **2012 to 2013: Once again, CO_2 emissions from fossil fuel combustion increased 2.6 per cent. The prime culprits were the residential and commercial sectors, homes and offices. The weather wasn't favourable. Heating-degree days increased 18.5 per cent. Cooler weather led to a 30 per cent rise in direct use of fuels (wood, coal or gas) in homes. Electricity use in heating rose 2 per cent. At the same time, the price of natural gas went up; its use in the electricity sector fell 10 per cent. Power plants shifted back to coal. In 2013, industrial production went up 2.9 per cent; the sector's emissions rose 4.2 per cent. This is a trend that needs watching. For, this used to be the only sector showing a fall in greenhouse gas emissions.**

Natural gas, particularly shale, has made huge strides in the past few years. It is cost-effective to use to generate and the US has already overtaken Russia in gas production. As a result of this switch, the contribution of coal-based power plants to electricity sector emissions has come down, from 85 per cent in 2005 to 77 per cent in 2014. Emissions from the electricity sector have reduced 1.8 per cent annually. At this 'business-as-usual' rate, by 2030, emissions from the electricity sector will be down by more than 35 per cent. But CPP's

intended target is 32 per cent: so CPP reflects, at best, what will happen in any case, because of falling prices of gas and the cost-effectiveness of generating power from this relatively cleaner fossil fuel source.

- Under the best and most-climate-progressive scenario CPP has projected, the US will still produce 22 per cent more primary energy in 2030, over 2013 levels. And this energy system will remain firmly locked into fossil fuels. In 2013, 78 per cent of the country's total primary energy came from fossil fuels. In 2030, 76 per cent will come from fossil fuels.
- In the current as well as all future scenarios, the US shift to renewables remains marginal. The contribution of renewables in the country's primary energy consumption has increased just 3 per cent between 1990 and 2014. Under CPP, renewables in 2030 will contribute 15 per cent of the country's primary energy production. But once we realise that, in 2013, renewables contributed 9 per cent, it becomes evident this shift is illusionary. It is not happening.
- The shift to natural gas to generate electricity will not reduce emissions in an energy growth scenario. This is because the US is under-estimating the future role of methane — the GHG emitted all through the natural gas production-to-use cycle — in its emissions reduction plans. The US is underestimating this GHG's global warming potential. Emissions due to leakage during production and transport are also underestimated. According to the International Energy Agency, even if three per cent of methane leaks from natural gas extracted from shale rock formations — called shale gas, the predominant source of US natural gas production today and in the future — or during production or transport or consumption, natural gas loses its advantage over coal. There is, therefore, enormous uncertainty about emissions related to the natural gas cycle. Combined with the fact that total energy consumption will increase substantially, US plans for clean power is not merely business-as-usual. It could, in reality, be regressive.
- In all, the US plan for clean power does not make the transition to renewables. Instead, it remains firmly locked-in into a fossil fuel energy future. The US is neither bold nor transformational, but business-as-usual, because the switch to natural gas, which is leading to lower emissions from coal-based power plants, is ocurring because it is cheaper for the US to do so. In fact, the future could be grimmer: CPP is based on the assumption that shifting to relatively cleaner natural gas will obviate the need for emissions reduction in energy production and consumption. The country can produce more and consume more, because this electricity will not be based on 'dirty coal'. But given the uncertainty about deadlier methane emissions from natural gas, this unrestrained growth in energy production could be disastrous for a cleaner future, for the US as well as for the world.

We conclude: the use of efficiency standards in the transport and building sectors to curtail emissions is not working and will not work in future, unless there is a brake on consumption.

The US government's climate action plans are based on one principle: efficiency. It will reduce emissions by taking aggressive measures to improve energy efficiency. It has mandated greater energy efficiency for vehicles, appliances and buildings. But our analysis clearly shows this presumption, this policy path, is deeply flawed. US consumption patterns are not changing. In fact, all trends show that as the economy is picking up people are buying more cars, more appliances and building bigger homes and offices. All efficiency gains are being squandered away.

- **Take the transport sector**. 1990-2013, the fuel economy of US vehicles improved by 16 per cent, but miles travelled by vehicles increased 7 per cent. This means real-time fuel consumption reduced only 7.7 per cent. The gain of emissions reduction because of fuel economy standards has vapourised because people are driving more.

The US government has notified further fuel economy standards, expected to reduce CO_2 emissions by 35 per cent by 2025. But, firstly, it is well known that fuel economy in showrooms is drastically different and lower than when vehicles ply on the road. Also, car sales are up and, by 2017, are expected to break the previous high record of 2000. The price of gasoline remains constant and there is nothing in US policy that restrains vehicle-driving — passenger cars or goods vehicles. Therefore, there is no reason to believe the future will not be more of the present. The 35 per cent emissions reduction that underpins the US climate action plan for vehicles could well turn out to be a dud, or close to it.

Indeed, there is no real change in the way the US travels. Over 86 per cent people travel to working using a car or a van; only 9.4 per cent carpool. The use of public transport to commute remains at a mere, and inconsequential, 5 per cent. This has also not changed in the last decade. As many people drove in the 1990s as they did in the first decade of the 21st century. Even in congested cities, public transport has not picked up: the highest decline in automobile commuting was in Greater San Francisco and that was only 4 per cent between 2006 and 2013. In other cities, 75-80 per cent people commute using a car. In this situation, however efficient a car becomes in terms of fuel usage, it will not reduce emissions. Young or old, people will just buy more and drive more.

In the US, over 70 per cent of the goods moved from one destination to another are done so on trucks. Trucks contribute 23 per cent of US transport sector emissions. Though it is well-known the railways are much more fuel- and emissions-efficient, its share is not growing. This is partly because of changed consumer behaviour: online-shopping and just-in-time delivery. This, combined with the lack of investment in the railways, as well as lower costs of fuel that makes the trucking business competitive and profitable, will make sure these emissions continue to increase.

- **Take the residential and commercial sector**. 1980-2009, energy intensity in the household sector of the US declined a whopping 37 per cent. Home insulation improved; space heating and cooling, and appliances used in homes and offices, became more energy-efficient. But in the same period, more houses were built and the size of houses increased 20 per cent. The enormous gains that could have been made were lost. 1980-2009, delivered energy to US households increased from 9.3 quadrillion British Thermal Units (quads) to 10.2 quads, an increase of 9 per cent.

This trend continues. Each subsequent decade, the size of buildings has increased. The average size of commercial buildings in the 1960s was 12,000 square feet (sq ft); in 2012, it increased to 19,000 sq ft. Average size of homes was 1,800 sq ft, which has now grown to 2,400 sq ft. As a result, electricity sales to the commercial and residential sector are increasing year on year, irrespective of increased efficiency.

It is the same with appliances. The US Energy Information Administration (EIA) notes that in the last decade, even as energy needed to heat or cool houses has come down, total energy used in the residential sector has not decreased. This is because the use of 'efficient' appliances increased dramatically, constituting 35 per cent of household energy consumption in 2009. This trend is expected to continue. In this way, too, the US government's plans to cut emissions will be decimated.

Why is change not happening?

The US is doing things in a business-as-usual manner, it does not want change. Certainly not change we can believe in. So, the fact that the US is not putting its economy on a low-carbon path is clear. The question is: why? It has the technological and economic prowess to be the climate change leader. So why is it not leading?

We conclude: economic growth and consumption is non-negotiable for the US. It wants to 'solve' the climate puzzle, without doing anything that will change the status quo. It wants the ultimate win-win — consume but not pollute. But as our analysis shows, till the time the US stays away from Consumption — the other C-word — the world will not be able to tackle climate change.

Consumption is the marauding elephant in the US emissions reduction room. It figures nowhere in US action plans on climate change. If this elephant is not reined in, there can be no emissions reduction — serious or non-serious.

Consumption is directly related to the price of energy. In the case of the US, energy prices have remained low and getting lower. An average American spends less on energy than what s/he did in 1990. In 1990, an average American spent 7.2 per cent of her/his annual personal expenditure on energy. In 2014, s/he spent 4.7 per cent. Such spending is one of the lowest in the world. 1990-2014, the urban consumer price index increased 81 per cent, but per unit cost of residential electricity

reduced 12 per cent. The result: per capita electricity consumption went up from 11,373 kilo-watt hour/annum (kWh/annum) in 1990 to 12,113 kWh/annum in 2014. All policy prescriptions to reduce emissions have been thrown out of the window.

Such numbers make more sense when we realise the US has the highest per capita household consumption expenditure in the world — in 2013 (at constant 2005 US $), double that of an EU-28 household, 24 times a Chinese one, 44 times an Indian's, 64 times a household in Bangladesh and 173 times a Malawi household.

Consumption expenditure in the US has also increased dramatically since 1990. The index of total personal expenditure on goods — a measure of a person's yearly spend — is up by 120 per cent; services 80 per cent. In terms of value, the US has doubled its total consumption of goods and services. An average American consumes 50 per cent more goods and services in 2014 than what s/he did in 1990. The real annual growth in personal expenditure has been 1.7 per cent since 1990.

Expenditure has gone up for most goods and services. But spending has skyrocketed — as in any rich society — on what can only be considered luxury consumption: recreation, furnishing, cars, houses, clothes and personal care. Can a 220 per cent more expenditure on recreation, 1990-2014, be considered essential?

This out-of-whack consumption is also the world's opportunity to reduce emissions. First, there is huge inefficiency in the US. Houses there are bigger than what Germans, the Japanese or the British build. A typical American household consumes 2-3 times more electricity than their rich counterparts in Europe. They own more cars than other rich people of rich countries. They do not use public transport. They do not use the railways to transport their goods. They waste so much food that it is shameful. All-round flab, that provides an easy opportunity to reduce emissions. It is not as if Europeans live in poverty. It is not as if this changed lifestyle will mean lack of wealth or well-being. The Planet cannot sustain the lifestyle of one America, let alone two or many.

In sum: if there is a limit to emissions in the world, then there also has to be a limit to consumption — unless the world learns to grow without carbon. Should there, then, be a limit on non-essential or luxury consumption, so that survival-related emissions and consumption-related spew can be shared across the world? Changing consumption patterns has to be on the high table of climate change negotiations. Otherwise, we are signing our common death warrant. Nothing less.

Why then is the US so bullish on climate change?

President Obama and his Secretary of State John Kerry are going around the world exhorting their counterparts to act on climate change. There is the Obama-Xi 'deal', the Obama-Rousseff 'deal' and so on and on. President Obama now mentions climate change in practically all his speeches. What is happening?

We conclude (sadly): the apparent change of stance is not a change after all. The US is doing everything so that it can to continue with business-as-usual and this will then shift the burden of transition to others.

The US has adopted an aggressive strategy to convince the world it is taking a leadership role on climate change. So, at every opportunity, a massive PR exercise unfolds, to show the world that what the US is doing is ambitious and historic. It doesn't want anyone to question its claims. Its claims are false. So the noise.

The problem is this BAU approach of the US directly translates to shifting the burden of transition to others.

Take the case of renewable energy. The US should have been leading the world in renewable energy investments. But it is not. In the last three years (2012-2014), the share of the US in total global investment in renewable energy has averaged 15 per cent. China, on the other hand, has accounted for 27.5 per cent of the total global investment in renewable energy in this period. In 2014, the US accounted for 14 per cent of global investment in renewable energy; China's contribution was 31 per cent and Europe another 21 per cent. China and Europe, therefore, are bearing the burden of transition to renewable energy. Large-scale investments in China mean that the global prices of renewable technologies are coming down, allowing other countries, including the US, to benefit from cheaper renewables. It should have been other way round, considering the responsibility and capability of the US.

Even India is sharing more of this burden than the US. In 2014, the US invested US $38.3 billion in renewable power and fuels. This was equivalent to 0.2 per cent of its GDP. In comparison, in 2014 India invested US $7.4 billion on renewables, or about 0.3 per cent of its GDP. In fact, India has set itself a goal to install 100 gigawatts (GW) solar power and 60 GW wind power capacity by 2022. In 2022, India will have at least 170 GW of solar and wind power capacity. The US will reach this level only in 2025.

In this way, the US has passed on the burden of shifting to renewables to other countries. Countries like India are installing renewables when they are expensive; the US turns to renewables only when they come cheaper.

The US doesn't want even a perception to go around that climate change will cost its economy. In its preamble to the Clean Power Plan, the US EPA has communicated to the American citizen that when CPP is fully implemented, "electricity bills would be expected to be roughly 8 percent lower than they would been without the actions in state plans".[1]

The US only wants win-win for itself, even if it is loss-loss for other. Loss-loss it will be for most developing countries, for not only will they have to reduce emissions, but also spend hugely on adaptation.

The win-win approach of the US has transformed the UN Climate

Change Convention from a forum where every nation was supposed to take action based on "common but differentiated responsibilities and respective capabilities" to a forum where now nations are competing in a race to the bottom. Today's climate action vocabulary accepts 'bottom-up', 'nationally determined action' and 'voluntary'. These are US inventions. To suit only the US.

It is pertinent at this juncture to remember what happened on July 25, 1997. On that day, the US Senate passed a resolution — the Byrd-Hagel resolution, passed 95-0 — that it made no sense for the US to be a signatory to any global action on reducing GHG emissions. At that time, global climate change negotiations had swiftly concluded GHG emissions had to be reduced, and reduction had to begin in the developed world. A protocol was in the offing. Global climate change action was on an upsurge.

States the resolution: "the proposals under negotiation, because of the disparity of treatment between Annex I Parties [developed countries] and Developing Countries and the level of required emission reductions, could result in *serious harm* to the United States economy..." [emphasis added]. The resolution resolves: "the United States should not be a signatory to any protocol to, or other agreement regarding, the United Nations Framework Convention on Climate Change of 1992, at negotiations in Kyoto in December 1997, *or thereafter*..." [emphasis added].

The resolution is still in force.

So, the big question confronting the world is: should the climate convention again be tailored — as was done in Cancun in 2010 and Durban in 2011 — to suit the convenience of the US? Or, should the world come together to fashion a global deal, which will suit the convenience of the poor and the most affected?

This is the issue in Paris. Nothing more. All else is optics and roadshow.

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Note: Unless mentioned otherwise, all graphs as well as figures (percentages, numbers) mentioned in this chapter have been generated by the Centre for Science and Environment using the dataset on US consumption expenditure provided by the US Bureau of Economic Analysis.

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