

**NEXT  
LEVEL  
CLIMATE  
THINKING  
AND  
ACTION**

CLIMATE  
ACADEMY

Chapter Four  
**Where are we now?**

Draft Version: Jan 2022

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## INTRODUCTION: VITAL STATISTICS

A fit and healthy baby that enters the world kicking and crying can score nine or a maximum 10 in the 'AGPAR Test' which is measured by doctors at birth.

It was much too quiet when my son was born. He only scored a one. Fortunately, the specialist neonatal intensive care unit was just upstairs. In close, rapid step with a team of nurses and doctors I carried his tiny, feebly spasmodic little frame to the warm safety of an incubator. There, he was swiftly hooked to multi-coloured tubes and wires. This technology would feed him, and continually measure and monitor all of his body's key indicators, 24 hours a day.

Over the next weeks, the ward was busy with general checks and moments of paperwork, close family visitors were ushered in during the afternoons. Sometimes, behind portable green curtains, key surgery was carried out. But in the reverential atmosphere of the unit, one thing was always familiar - the background chimes of the monitors that kept watch over every baby's vital statistics. If the oxygen level in their blood dropped below a certain level, the digital numbers would turn blue, a small light would flash, and the tone of a slow ticking chime would start to accelerate and rise in pitch. Someone in a medical uniform would then appear to make the right adjustments.



Thibault pulled through. On the day of his discharge from the hospital, I took a moment with a coffee in the bar downstairs and thumbed through a copy of *'The Economist'*. After skim-reading the articles on *'Orban versus the intellectuals'* and *'Zuma versus his people'*, I absentmindedly reached the back pages. Here, all of the vital statistics of the global economy were presented.

The data on these *'Economic and Financial Indicator'* pages show all the key signals from around the world, from the Greek GDP to the Colombian CPI, and from the rates of Belgian Bonds to the value of the Russian Ruble. The Nikkei 225 and the CAC 40 are monitored alongside the movements in the dollar price of Gold and West Texas Intermediate Oil. These indices can control the social and political weather - a drop in the price of oil had given a boost to the profit margins of the Pirelli in Italy, but it was causing social unrest in Venezuela. The long-term unemployment data in France and the UK had swollen the numbers of voters on the political edge, especially towards the Right.

However, Thibault was born into a world in which there was no fundamental index to measure our progress with climate change. This remains true today. In the pages of *'The Economist'* there was no tracker of how many gigatonnes of carbon we could safely emit before our whole

economic system is placed into a situation in which all economic activity will be critically undermined. There was no clear index of the good, the bad and the ugly for emissions and resource consumption.

For all of those millions of people who are deeply concerned about the climate crisis, where do they go to get a reliable update about the state we are in? We all want to hold our governments to account for their inaction, but how can that possibly be measured if there are no established norms for emissions? How do we defend human equality before the law if the law has no international and scientifically informed standard to plug into? How do we uphold universal human rights if we do not make our calculations of emissions on a *per capita* basis?

### Questions

1. **What different reasons can help explain the absence of a global index for climate change?**
2. **How do nations declare the commitments to climate change?**
3. **Where could this index be displayed in public?**

## MAIN TEXT:

### WHERE ARE WE NOW?

If we had a beep to signal the situation we have with climate change then that beep would be increasing in pitch. In fact, the beep has always been increasing in pitch and the intervals between those signals would be continually shortening.

This can be seen in the graph below which represents the last \*\* years of our greenhouse gas emissions. It clearly demonstrates the upward momentum of our greenhouse gases emissions. We are not *decreasing* greenhouse gases in the atmosphere, we are still *accelerating* their increase. The line on the graph is going up, and new records are being set every year.<sup>12</sup>

In the last 30 years, radiative forcing (the technical label for the 'warming effect') has risen 49%. The overall average increase was 0.03 w/m<sup>2</sup> per year, but the last 5-year average was 0.04 w/m<sup>2</sup> per year.<sup>3</sup>

A rise from 2.1 to 3.1 W/m<sup>2</sup> radiative forcing might not sound like a lot, but when the 1 Watt per square meter increase is cashed out into a different set of units, the reality of it all is rather amazing. A 1W per m<sup>2</sup> increase across the entire earth's surface amounts to a 510 trillion-Watt force.

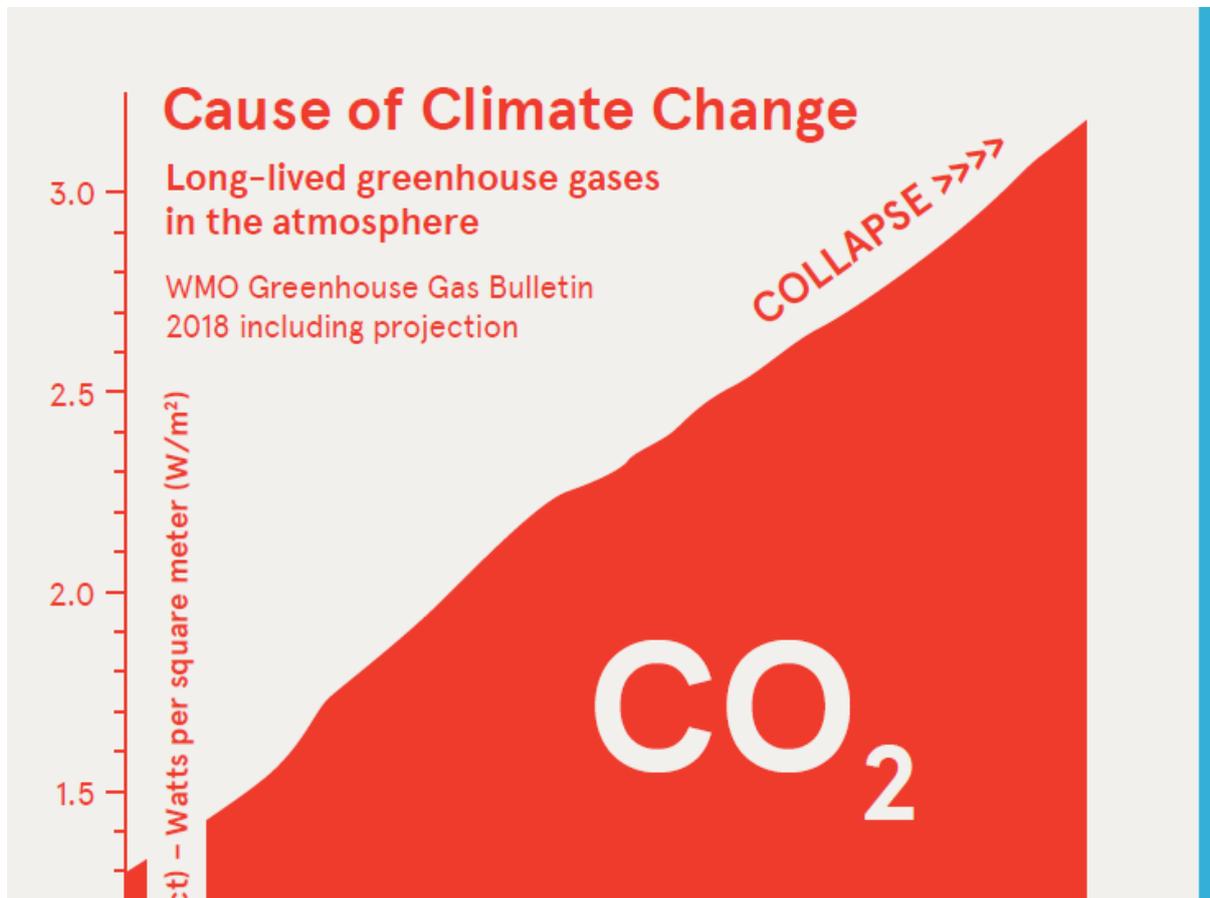
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<sup>1</sup> UNEP *The Emissions Gap Report 2019*, United Nations Environment Programme (2019).

<sup>2</sup> PBL *Tabellen mondiale CO<sub>2</sub> en broeikasgasemissions 1990-2018*, PBL Netherlands Environmental Assessment Agency (2019).

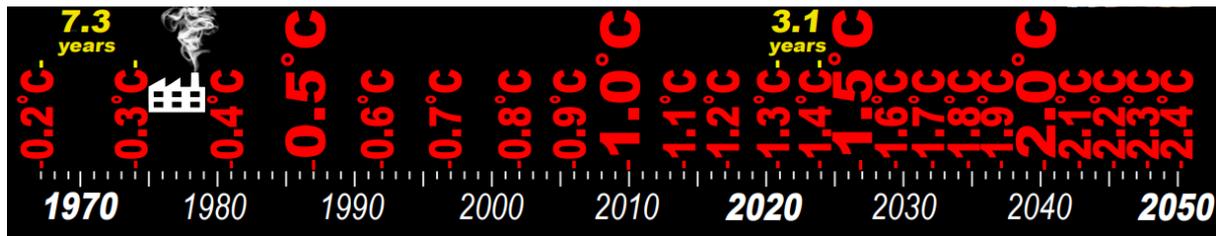
<sup>3</sup> National Oceanic and Atmospheric Administration Earth System Research Laboratory, *The NOAA Annual Greenhouse Gas Index* (1979-2018).

This upturn is the equivalent of 600,000 Hiroshima nuclear bomb explosions per day.<sup>4</sup>



To bring the acceleration of the warning signal more clearly into view. The next chart shows the shorter and shorter time that lies between each notch of 0.1°C up the global warming average temperature scale. Back in 1970s, when we had a full understanding of the problem it took 7.3 years to move from 0.2°C to 0.3°C warming above the pre-industrial average. Now our emissions are pushing us through those steps of temperature in just 3.1 years. To state the obvious, since we have had a full understanding about the mechanics of climate change and the need to reduce our emissions, we have only accelerated them. Indeed, we are now emitting at double the speed of the 1970s.

<sup>4</sup> Increase of 1 W = 1 J / s, earth surface 510.1 trillion m<sup>2</sup>, thus increase 1 W/m<sup>2</sup> equals 510 TJ / s for total earth surface. Energy content of Hiroshima bomb 'Little Boy' is estimated to be equivalent to 63 TJ. Increase of 1 W/m<sup>2</sup> is the equivalent of 510 / 63 = 7.6 'little boys' per second or about 600,000 Hiroshima nuclear bombs per day for earth.



Credit: OnlyOneEarth.science

## The Carbon Budget

What is the state of play looking forward? How much danger are we in now? How close are we to triggering different tipping points in the atmospheric systems? There is such a fog of information in the media and on the internet that is very difficult to get a secure understanding of our situation. Therefore, this module aims to put that right by identifying the key figures that lie behind all the other signals and noises.

The fundamental question is “How many more gigatonnes of carbon can be emitted before we commit ourselves to a 1.5°C or 2°C rise?”<sup>5</sup> It is clear that we cannot go on accelerating our emissions forever, there is a limit somewhere. Our bodies could handle a rise of 1.2°C warming for a short period, but a rise of 6°C would almost instantly kill us.

The safest interference with the atmosphere would be as close to a 0°C rise as possible. Returning to the kind of climate that human civilization thrived inside for thousands of years should be the ultimate goal. However, the World Meteorological Organization confirmed in 2019 that we have already achieved a 1.2°C increase.<sup>6</sup> Having already overstepped a 1°C rise, human society has passed a threshold that scientists warned us that we should not cross decades ago.

Given that anything over this line carries significant risk, the boundary for a global warming rise was set at COP21 in Paris in 2015. According to the Paris agreement, nearly every nation of the world committed “...to limit global warming to well below 2°C, preferably 1.5°C”.

The reason that 2°C is identified as a key upper temperature limit is that if this line was to be crossed we are firmly putting ourselves into a minefield of tipping points; and if we trigger these, the monumental forces of nature will just take over control of the situation and we will be faced with a cascading set of catastrophic circumstances. This is more fully explored in Module 8.

Researchers are constantly refining their modelling of how the biosphere would respond to heightened CO<sub>2</sub> levels. They have to consider so many variables when making these calculations. Dealing with such a complex and chaotic system necessarily means that there is a range of probabilities involved, however, we do have a very secure understanding of what is going on. There is a known carbon budget for 1.5°C warming and for 2°C warming. These limits come from the 2018 IPCC Report Global Warming of 1.5°C that was updated in 2021 by the IPCC’s Sixth Assessment Report (AR6).

<sup>5</sup> There are some important qualifications to the numbers in the section. Firstly, these are for a 67% probability to limit warming to 1.5°C or 2°C since pre-industrial average. It relies on a rapid reduction of other greenhouse gas emissions and accounts for earth feedback systems. It does not include any negative emissions or temperature overshoot (then cooling).

<sup>6</sup> <https://public.wmo.int/en/media/press-release/2019-concludes-decade-of-exceptional-global-heat-and-high-impact-weather>.

## Where are we now?

At the time of writing these budgets were \*\*\* gigatonnes for 1.5°C and \*\*\* gigatonnes for 2°C. It is probably best visualise these as buckets:



April 14th 2021

If we imagine these as empty buckets, we now need to know how quickly they are being filled up. The answer is that humans are currently emitting about 42 gigatonnes of greenhouses gases per year. Which might look like this:

42 GtCO<sub>2</sub> (pa)



Doing some quick mathematics, it is clear that we have just a bit over 6\* years before the budget for 1.5°C is used up, and around 19\* years before we hit the limit for 2°C warming<sup>7</sup>.

If we take the Paris Agreement at face value, and assume that all of the nations of the world actually want to limit climate change to well below 2°C, then this carbon budget would be the starting point and the end point of the commitments and the negotiations that follow.

The bottom line is as simple as this. And the powerful work of Michael Wadleigh and Birgit van Munster enables us to see these budgets diminishing in real time with something that

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<sup>7</sup> Insert qualification here about % probability – 67? Or 87?

they created and named, “The Gigaclock”. When all the data is assembled into one place and all the scientific co-ordinates given, the remaining budgets can be seen moving towards zero at the current/right speed.



So from this clear central point a proper vantage point is established to look forwards and measure the commitments on the table, and pathways that we are on. Without this base established, how could anybody clap or boo a statement given by the UN or by a national government about its latest commitment. For the moment there is a rather improbable situation where phrases like “a new ambitious target” can be used without any reference to the remaining carbon budget. It would be genuinely uplifting to be able to applaud robust action and it is simple principle of democracy that we should also be able to identify where actions that fall short.

## WHERE ARE GOING?

### The Emissions Gap

We are speeding towards these carbon budget limits. However, we need to have a clearer view of what lies ahead. Maybe if we start to push the brakes hard enough, we could stop before those lines? Our efforts in the past have not managed to curve the trend downwards, but perhaps there is brighter news ahead? There is a continual flow of new commitments from different nations, and it is important to know if we need to applaud them or not. Module 5 will get into the details for each country, in Module 4 (here) things will be kept at a global level.

Unfortunately, the commitments made so far fall a long way short. The policies and action that are required to get “well below 2°C” are still distant. This shortfall is known as ‘The Emissions Gap’.<sup>8</sup> In Paris (COP21), all the nations of the world agreed to put forward their NDCs towards stabilising GHG in the atmosphere. An NDC is a “Nationally Determined Contribution”, it is a non-binding declaration of intent by a country towards the climate crisis. There are few minor exceptions to this. Most interestingly, Nicaragua neither offered an NDC, nor did it sign the Paris Agreement with everyone else. This was not because of some delusional leader, but, rather nobly, it was because they simply wanted to point out the size of the emissions gap and they wanted to protest about the lack of serious action.

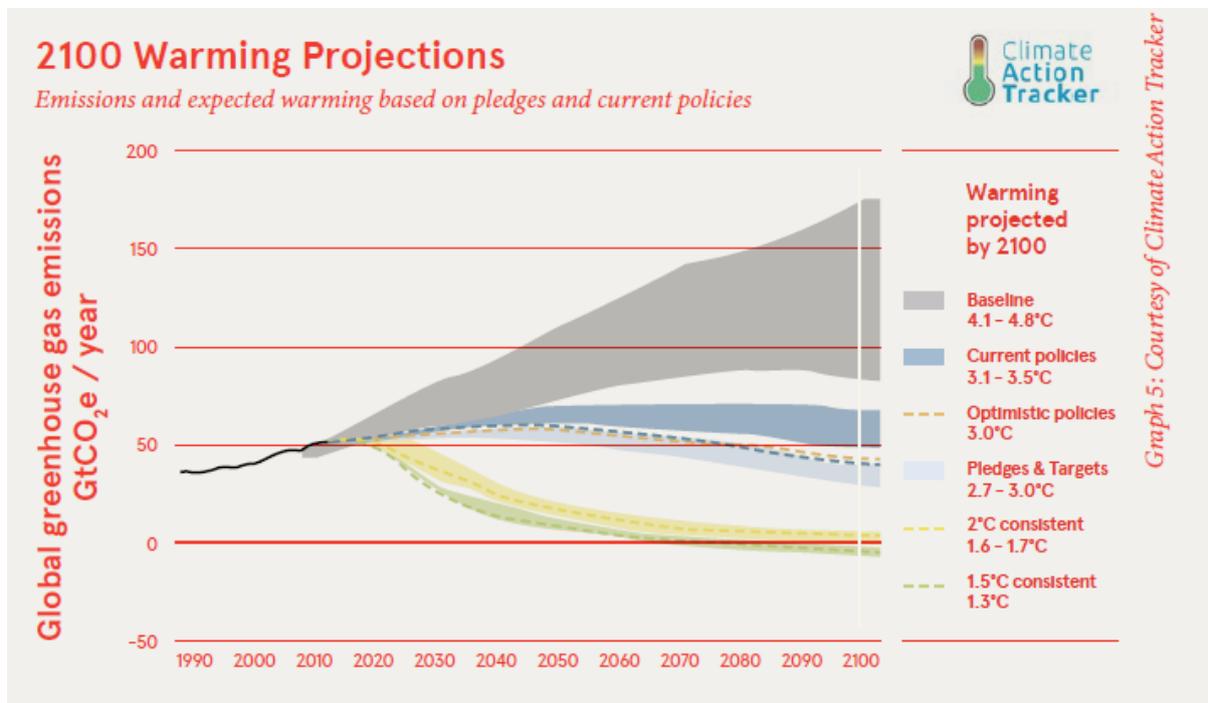
Indeed, when all of the NDCs are added up, and assuming that every nation will follow through on the commitments that they have made, humanity is still heading for a climate that is projected to be an intolerable 3-4°C warmer.

This is can be seen in the two blue sections on the graph below: the upper dark blue area represents the current policy commitments, and the lower lighter blue represents the pathway if current targets are met. It might be the case that nations enter into a positive feedback loop

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<sup>8</sup> UNEP (2019) *The Emissions Gap Report 2019*, United Nations Environment Programme (UNEP) Nairobi, figure 3.1.

with policy making once public opinion swings firmly behind climate action, but it is also true that nations can emphatically swing the opposite direction, such as with the USA under Trump and Brazil under Bolsonaro.



### Two very important qualifications

If your antennae are sensitive to climate change news, or if you engaged enough to dig around on the internet to find out more about where we are up to, the figures of 2.7-3°C from the graph above might sound broadly familiar. For example, the BBC often cites numbers in this range, or even below<sup>9</sup>.

However, a two crucial qualifications are needed.

#### a) Negative emissions

<sup>9</sup> "Climate change: Promises will mean rise of 2.4C – study" (May 4<sup>th</sup>, 2021, Roger Harrabin).

The graph above is actually misleading. Indeed, it is very misleading. It looks like, with all the recent NDCs added together from the different nations and with those commitments fully implemented, we would be able to drag the temperature rise down to 2.7-3°C. But within the algorithms that are used to make all the projections of those lines, there is a huge assumption about our ability to suck out greenhouse gases from the atmosphere with technology.

The problem? This technology does not exist, nor is it close to existing. It is imagined that we are able to suck CO<sub>2</sub> out of the atmosphere on a truly massive industrial level with engineering that does yet exist.<sup>10</sup>

The climate scenarios that the media almost always use rarely disclose that calculations include these 'negative emissions'. This distortion can be traced by the UN itself, who publish their own projections with this highly optimistic assumption included in the algorithm. This was true of the Emission Gap report that was published by the UN in 2019\*.



It seems to be neither correct, nor transparent, to have such reductions in greenhouse gases included in the graphs, yet they almost always are. It is a bit like fiddling the milage dial on your car.

In the absence of a handbrake turn by our juggernaut of emissions, a rise of 1.5°C is inevitable.<sup>11</sup> Module 5 on "Cut 11%" will articulate exactly how sharp the emissions reductions will have to be for each nation of the world to duck under the 1.5°C threshold. Importantly, the numbers used by the Climate Academy do *not* include any unproven capacity for negative emissions. A move that seems like an entirely scientific way to go about things<sup>12</sup> and in line with simple common sense. Indeed, the calculations in Cut11% also stay well clear of a dabble with in the scientifically and ethically dubious potentials of geoengineering.

If the media reporting was more transparent about the current path that we are on, then the projections would show that we are actually heading for a rise of around 4°C by 2100. Another way of stating the facts is to acknowledge that the current NDCs only add up to a commitment that is one sixth of what is required,<sup>13,14</sup> and even with this on the table, many major industrialised nations are not even on track to fulfil these limited commitments.<sup>15</sup>

The skewed reality that follows from being far too optimistic about carbon capture technology unsurprisingly also skews the language and framing of the reporting of the climate crisis. For example, the BBC's Science Correspondent, Matt McGrath, published an article just before COP21 in which he reported that 15 leading Buddhists, including the Dalai Lama, had called for the Paris Agreement to limit warming to 1.5°C. However, no comment was made about this ambition being

<sup>10</sup> Even if it were to exist, such projects would suffer from the usual objections of NIMBY (Not In My BackYard)

<sup>11</sup> Rogelj J., et al. Paris Agreement climate proposals need a boost to keep warming well below 2 °C. *Nature* 534, 631-639 (2016)

<sup>12</sup> 248 Anderson, K. & Peters, G., "The trouble with negative emissions." *Science*. 354, 3609, p. 182-183 2 p (2016)

<sup>13</sup> United Nations Environment programme, Emission Gap Report 2018

<sup>14</sup> 250 These figures were all correct at the time of going to press. As different editions of the book are published, these figures will be updated. For updates, see [OurFutureUncompromised.org](http://OurFutureUncompromised.org).

<sup>15</sup> 244 Victor, D.J. et al. *Prove Paris was more than paper promises*. *Nature* 548, 25–27 (2017)

so highly improbable.<sup>16</sup> This is just one example, but once you have understood the 6 year proximity of 1.5°C and the cliff face that emissions will have to fall down to meet that target, it is impossible not to follow most media output with a sense of incredulity.

As stated above, the ultimate goal must be to not only restrict warming to 1.5°C but drag it down towards zero. But this is not going to happen if we massage the numbers to look more comfortable. It seems imperative to be square and blunt with what is going on above our heads, a softening of the truth is most likely to lead to a softening of response.

### **b) Global Warming 'Whiplash'**

The second important qualification is something that could be given the label 'whiplash'. This is not a technical term, but it gives a good idea of what will happen to global temperatures if we suddenly hit the brakes on our emissions.

Burning coal is really not a good thing to be doing. It is worse than oil and much worse than gas in its capacity to release greenhouse gases. However, there is a little detail about coal burning that is not well known. Namely, coal power does not only release CO<sub>2</sub> into the atmosphere, it also emits small particles of dirt.

There is good news and bad news about this. The good news is that these particles when they go up into the atmosphere actually help keep the atmosphere cool because they deflect the sun's thermal energy back out into space. The bad news is that when you stop burning coal you also lose this benefit. Therefore, when these cooling aerosols ('aerosols' is the scientific term for these specks of dirt) disappear it will trigger a sudden jump in temperatures of 0.8°C.

Ouch.

Whiplash is very painful and damaging both in a car, and with the climate.

As with negative emissions, it would be better if this mechanism in the physical cogs of the atmosphere was clearly acknowledged in our projections and in the media that analyses them.

## **Conclusion**

This module will finish by zooming in the key issue behind why so little has gone in the right direction. Given the complexity of the situation this might seem like an ambitious claim for a few hundred words. However, a simple chain of cause and effect can point to the fundamental problem: global heating is caused by increasing concentrations of greenhouse gases, these gases are mainly caused by the use of fossil fuels. It is the deep inertia of our global systems to move away from a dependency on fossil fuels that is behind the continued acceleration of emissions.

The key point here is that this dependency is *structural*.

It is bracing to see the stark reality of where we are up to, and given that so many individuals are making a major effort to do something about it, it seems absurd that we find ourselves so close to these important thresholds.

But this is the point – the individual does not have the power to trigger the impetus needed. We all operate inside a system of energy production that drives our manufacture, transport,

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<sup>16</sup> <https://www.bbc.com/news/science-environment-34658207>.

\* and \* that is underwritten by fossil fuels. Until this over turned, we will only be making predominantly superficial changes to the global carbon footprint.

There have been millions of green initiatives launched by communities, schools, local governments. These efforts have been matched by billions of individual actions too.

This is awkward. We like to feel like we have agency in problems. It is tactile and rewarding to sense that we have some kind of control and grip on what is going on. And this natural pull of our psychology is matched in kind by the media, the UN and national governments.

Such natural flows of attention and awareness have been strongly encouraged by the fossil fuel industry as it distracts attention away from the systemic cause of the crisis – the fact that our infrastructure is plugged into fossil fuels. One of the most amazingly resilient myths of modern thinking is that an “Energy Transition” has been taking place. It has not. There has been no reduction in our dependency on fossil fuels towards non-emitting energy sources.

### **No energy transition**

It is arguable that the phrase, “energy transition” should be banned. This is because it is often used to refer to something that is happening now. It isn’t. It has never been. It is something that we urgently need to do, but then, is the word “transition” appropriate? What is required is a transformation not a transition.

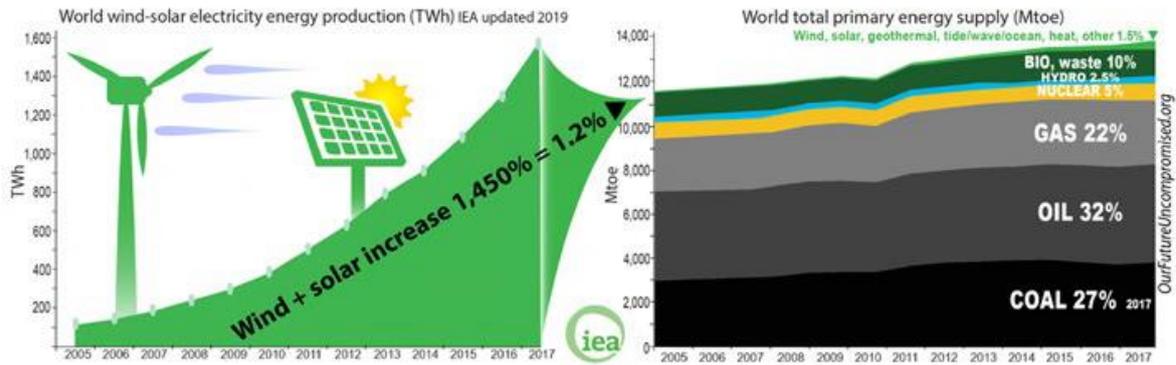
Our continually increasing emissions are due to the fact that we are still meeting the large majority of our energy demands with fossil fuels. The chart on the right shows that 81% of all our energy is produced by either coal, oil or gas. These statistics are taken from the latest data of the International Energy Agency.

This data also shows that wind and solar power has dramatically increased from around 110 Twh to over 1,580 Twh since 2005, a whopping 1,450% increase. However, increasing the size of an apple pip by 1,450% does not change much if it is in competition with slowly inflating Beach Ball or Hopper Ball<sup>17</sup> that had a sizeable head start. In fact, although the use of fossil fuels increased by a much smaller percentage, it outstripped green energy growth by 11 times in absolute terms.

In COP21 in Paris, President Obama proudly underlined the “ambitious investments” [sic] that the USA had made in tackling climate change by talking about the size of his ‘apple pip’: “Over the last seven years, we’ve made ambitious investments in clean energy, and ambitious reductions in our carbon emissions. We’ve multiplied wind power threefold, and solar power more than twentyfold.”

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<sup>17</sup> For those who have never met one, a Hopper Ball is that big orange bouncy thing with a grizzly face that could serve as decent symbol for the fossil fuel industry, especially as Donald Trump “digs coal”.



Graph 2: Courtesy of Homo Sapiens Foundation, OurFutureUncompromised.org

Globally, wind, solar, hydro and all other renewable non-emittive energy sources still only account for 4% of humanity’s energy supply. Nuclear Power, for all of its other complications, is at least carbon friendly, so we get to 9% with this included. Biomass (which is emittive and has great unsustainability issues) is about 10%.

The impression that we might have, from casually observing solar panels on people’s roofs or wind turbines in the open fields by motorways, is that green energies are significantly replacing fossil fuels. Politicians may frequently cite their commitments to huge-percentage increases in green energy supplies.

However, the data that matters shows very clearly that we are not making any inroads into curtailing our reliance on fossil fuel. The word “transition” for the energy sector is dangerous misnomer. The whole energy industry is stuck in stasis.<sup>18,19</sup>

In fact, all of the recent policy commitments to new investments in green energy are not even sufficient to deal with the increased demand for energy that will come in the years ahead from factors such as consumption and population growth.

Therefore, in the absence of commitments that are rooted in the reality of the remaining carbon budget, fossil fuel use and emissions will continue to increase until 2030 and beyond.<sup>20,21,22</sup> This decisive move away from fossil fuels must also be accompanied by a more modest culture of consumption too. It is tempting to say that it must also be characterized by a reduction of human population, but this is complex of course. The fact is that the territories of the world that consume way beyond the average have flat or declining populations and their historic emissions have made the traditional pathway to economic growth through the dense power of fossil fuels impossible for these developing nations.

<sup>18</sup> T.C.J.Dangerman & A. Grossler, “No way out? - Analysing policy options to alleviate or derail Success-to-the-Successful in the energy system”. (2013) <https://hdl.handle.net/2066/91359>

<sup>19</sup> Wainstein, M; Dangerman, J; Dangerman, S, *Energy business transformation & Earth system resilience: A metabolic approach*, *Journal of Cleaner Production*, 2019, 215 pp. 854 - 869

<sup>20</sup> United Nations Framework Convention on Climate Change (UNFCCC) *Updated synthesis report on the aggregate effect of the Intended Nationally Determined Contributions (INDCs)* May 2016.

<sup>21</sup> PBL Netherlands Environmental Assessment Agency, Climate Pledge NDC Tool, Global emissions, <http://themasites.pbl.nl/climate-ndc-policies-tool>.

<sup>22</sup> United Nations Emissions Gap Report, 2019, figure ES4.

## **Infrastructure not Individuals**

As stated in the introduction to this book, individual actions about their choices in consumption are valuable. Any new global situation that feature a dramatic drop in our emissions will necessarily be characterized by much more modest markets and by clever circular consumption. There is no way around this. All of our efforts to reduce our carbon footprint have to be sustained.

But what has decades of the fight for climate justice achieved with individual actions as the dominant narrative? The answer is vividly clear in the dots of the Keeling Curve.

The plank in our eye is our systemic dependency on fossil fuel, and this can only be flipped by the leverage that available with legislation. We have to be blunt with ourselves. There is so much more to be won with a transfer of energy and focus. When Martin Luther King was fighting for equality and justice he was stubbornly focused on legislative change. He was intolerant of any gesture from the US government that did not grant fundamental rights at a system level. He was right to keep his eye on that prize. He would have never celebrated comfy seats in the black area of a café or a bus.

The real action in any society takes place at a legislative level. It is the matrix that governs everything. The framework of laws, both national and international, guide investments, infrastructure, in short, everything.

The markets know this and the fossil fuel industry knows it.

It is not by chance that in the first three years following the Paris Agreement in 2015 the five largest publicly-traded oil and gas companies (ExxonMobil, Royal Dutch Shell, Chevron, BP and Total) invested over \$1bn in what is known as “narrative capture”.<sup>23</sup> One of their central methods of gaining control over the content and approach of climate change awareness has been to wage a war on plastics and a reduction in their use - a savvy way to look ethical and skew our thinking towards individual action. Indeed, the cause of reducing plastics is very visual and tactile. For example, not taking a plastic bag in a supermarket feels good, but in this case, it is carbon footprint of all the food and stuff that beeped past the check-out that really matters. Just to press home the point, all plastics are only responsible for one in every 256\* tonnes of our greenhouse gas emissions. So their reduction hardly makes a difference to the climate, and it makes little difference to the profit lines of these major companies.

## **Conclusion**

The vital statistics of our planet do not look good. But with respect for science and a deeper love of human life and all the insane

Which just need to come out from under the bewitching spell of the self. We need to take our individual, consumption based thinking and enlarge it. The beautiful and powerful truth about the fight for climate justice is that an engagement in projects that are aimed at

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<sup>23</sup> [www.influencemap.org](http://www.influencemap.org) is a valuable organisation that exposes the details of those investments.

systemic change involve our whole self, not just the cropped version of humanity that we have adjusted ourselves to.