Climate Change: Five Easy Pieces about the Past and the Coming 30 Years

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Climate change is upon us!

When we entered climate change research, 30 years ago, we were told that if we would not put a break on the use of fossil fuels -coal, oil and natural gas- and reduce their emissions of greenhouse gasses, we would warm up our Planet and create a serious problem for our grandchildren. Solving this was a matter of developing new energy technologies and implementing them through subsidies and innovative taxation mechanisms. However, the world did not nearly do enough of all this. In the meantime, most of us have grandchildren and climate change is upon us.

According to the latest report of the Intergovernmental Panel on Climate Change (IPCC) in 2023, it is a fact that humans have warmed up the Planet by 1,1 °C compared to pre-industrial times[1] (1). In 2024, the Planet reached 1,55 °C, be it only for that single year[2] (2). The report further states that the observed increase in local extreme weather events such as hot and cold spells, droughts and heavy precipitation, are a result of this global warming of "only" 1,1 °C. Every 0,1 degree more will further increase the frequency and intensity of these local events and it is only a matter of chance whether the next weather disaster will hit our backyard or that of our neighbour. A kind of Russian roulette, indeed, but one in which the number of bullets in the cylinder increases with time.

Compared to 30 years ago, the climate problem is now more complex to solve. We have to continue and try to phase out the use of fossil fuels to avoid the worst of climate change impacts, but we now also have to deal with the negative impacts that we could not avoid. We also learned that such impacts are mainly felt in poor and therefore vulnerable communities, both in developing and developed countries, communities that hardly use fossil fuels and hardly contribute to the problem. The impacts of today's fossil fuel use and its emissions of greenhouse gases will also be felt during the lifetime of those who aren't born yet and, obviously, didn't contribute to the problem either[3]. Climate change is fundamentally an ethical problem and if it is not solved it will only exacerbate existing inequalities. Who are we in the rich part of the world that we can destroy livelihoods in its poor part? Who are we adults that we can *"steal the dreams"* of the children about their future (3)? Who are we Homo Sapiens that we can destroy animal and plant species, glaciers, forests, entire landscapes?

We better treat it as an emergency, but we don't ...

In 2018 the IPCC published a special report in which it states that: *"... instabilities [in the climate system, leading to multi-meter* sea level rise] could be triggered at around 1,5 °C to 2 °C of global warming" (1). The report further showed that, in a business as usual scenario, global warming could reach 1,5 degrees as early as 2030. After having read this report, Greta Thunberg, who had been concerned about climate change for years, got angry. Having the impression that nobody was seriously reducing the emissions of greenhouse gasses, and nobody asked to prepare for climate change impacts, she pointed out that the world is in a climate emergency: "around 2030 *[...] we will set off an irreversible chain reaction beyond human control [= tipping points] that will most likely lead to the end of our civilisation as we know it"* (3).

In 2021 the IPCC consensus was more prudent and stated that *"establishing links between specific levels of global warming with tipping points and irreversible behaviour is challenging ... "*, but it continued saying: *"... [tipping points] however cannot be excluded, and their likelihood of occurrence generally increases at greater warming levels."* This all means that 1,5 °C of warming is not a hard wall where we risk crashing into. It is rather a signpost indicating that we are entering uncharted terrain in which the world's climate could tip into something much less benign for Life as we know it. That is something "too risky to bet against " (4). In this spirit of precaution and in a strange move that put climate policy-making ahead of climate science, low laying island States that are obviously vulnerable to raising sea levels, pushed the United Nations (UN) and finally succeeded to have an objective of 1,5 °C in the 2015 Paris Agreement. In practice, not going beyond 1,5

1. A Panel set up by the United Nations in 1990, to report every 5 years about the state of knowledge regarding climate change, its impacts and the solutions to the problem. All reports can be downloaded at www.ipcc.ch. The sixth report, consisting of different volumes, was published in the time period 2021-2023. The seventh report is scheduled for completion in 2027.
2. The 1,1 °C temperature increase mentioned in the IPCC report, refers to the difference between the average temperature over the past 30 years (1991-2021) and the average temperature over a 30 years' time period in pre-industrial times. The objectives of 1,5 °C or 2°C mentioned in the Paris Agreement also refer to 30 years averages. Hence the 1,55 °C temperature increase in 2024, which refers only to the average over that single year, does not yet mean that the 1,5 °C objective of the Paris Accord has been breached.
3. This is all a simple consequence of the fact that, once a molecule of CO_2 is emitted in the atmosphere, it stays there for about 100 years and has ample time to travel around the world.

FIGURE 1: Most profitable companies according to Fortune 500 (9). Before COVID (2919) during COVID (2021) and after COVID (2024). Shown are the annual profit in billions of dollars.

most profitable companies in 2019	profit (billions $)	most profitable companies in 2021	profit (billions $)	most profitable companies in 2024	profit (billions $)
Saudi Aramco	110,9	Apple	57,4	Saudi Aramco	121,0
Apple	59,5	Saudi Aramco	49,2	Apple	97,0
Indust Com Bank of China	45,0	SoftBank Group	47,0	Berkshire Hathaway	96,2
Samsung	39,8	Indust Com Bank of China	45,7	Google (Alphabet)	73,8
China Construction Bank	38,4	Microsoft	44,2	Microsoft	72,4
JPMorgan Chase	32,4	Berkshire Hathaway	42,5	Indust Com Bank of China	51,4
Google	30,7	Google	40,2	JPMorgan Chase	49,6
Agriculture Bank of China	30,6	China Construction Bank	39,2	China Construction Bank	47,0
Bank of America	28,1	Agricultural Bank of China	31,2	FACEBOOK (Meta)	39,1
Bank of China	27,7	FACEBOOK	29,1	Agricultural Bank of China	38,0
Royal Dutch Shell	23,3	JPMorgan Chase	29,1	Exxon Mobile	36,0
Gazprom	23,2	Bank of China	27,9	Johnson & Johnson	35,2
Wells Fargo	22,3	Tencent Holdings	23,1	Toyota Motor	34,2
FACEBOOK	22,1	Alibaba Group Holding	22,2	Bank of China	27,9
Intel	21,1	Samsung	22,1	Amazon	30,4
Exxon Mobile	20,8	Amazon	21,3	Nvidia	29,8
AT&T	19,3	Toyota Motor	21,1	UBS Group	27,8
Citigroup	18,1	Intel	20,8	Taiwan Semiconductors	27,4
Toyota Motor	16,9	Pin An Insurance	20,7	Bank of America	27,0
China Development Bank	16,7	Bank of America	17,0	Petrobras	24,9

°C of global warming requires that the global net emissions of greenhouse gases should be zeroed by 2050.

Ten years on, the policies agreed so far by individual countries that signed up to the Paris Agreement are still not sufficient to comply with this (5). For instance: the global emissions of energy-related CO_2 continued raising and, after a small dip during the COVID period, reached again a record high in 2023[4] (6). This all means that the world is presently on course for a warming of 2,6 – 3,1 °C over the course of this century (5).

Why is it so difficult to solve?

Despite more than 30 years of IPCC reports and UN negotiations and resulting agreements, pacts, roadmaps, etc. the burning of coal and oil continued and its emissions of greenhouse gases increased year after year. Why? The problem is wicked, the reasons are many and intertwined.

One difficulty is undoubtedly bringing all 195 countries in the world around the table and come to an agreement about how to solve a problem that is created by only a few of those countries, but has impacts for all of them. However, the following is certainly also an important part of it, if not the most important one: in most of the past 30 years, a close-knit group of global investors and entrepreneurs, supported by neo-liberal policies that gave them free rein, increasingly put company and even personal profit ahead of the wellbeing of others and that of the Planet. Hence, investments were simply made where the returns were highest, i.e. in the most profitable companies. In the years before COVID, these companies were banks (one makes money with money …), high tech companies followed by oil and gas companies as well as car companies (Fig. 1).

In the COVID years 2020 and 2021, oil companies were much less profitable. In 2021, according to Fortune, BP, Royal Dutch Shell and Exxon Mobile even made annual losses of around 20 billion $ each (7). These losses were undoubtedly due to less demand for transport during the pandemic. As mentioned before, the economy recovered and some energy companies are now making even more profit than before COVID (Fig 1). However, in their forecasts for the next decades, European oil companies do consider lower demand because of greater public awareness and political discourse about climate change, as demonstrated by e.g. the 2015 Paris Agreement (8). Hence, there is a risk for investors and they might start turning away from fossil fuel companies and invest elsewhere. That "elsewhere" could well be renewable energies, for which demand is clearly on the rise and production cost has fallen significantly during the past decade. Putting all this together, many observers of the energy sector claim that a process might have been set in motion that could effectively phase out fossil fuels.

The crucial questions are: if this transition can be completed within the next 30 years, and if it can be done without leaving the neo-liberal logic in which the individual is blindly put above the collective. The answer, at least to the second question, must be negative, as demonstrated today by the USA where neo-liberal and "my country first" policies reign supreme and coincide with cancelling existing climate policies and suppressing even climate science (9).

Change, crises and social tipping points

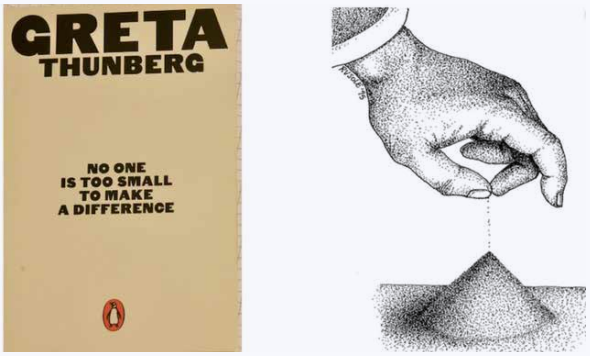
Despite the increase in global emissions, the emissions in the EU dropped by 33% between 1990 and 2022 (10). They decreased for three reasons: 1- moving heavy polluting industries outside the EU, 2- successful implementation of dedicated climate and environmental policies and 3- the occurrence of several unpredictable events (crises/opportunities). Each of the latter events (the fall of the Berlin Wall, the financial crisis 2008-2010, COVID 2020-2021, the War in Ukraine) lead to structural changes in the European economy and society (that were guided by policy making!) with a significant decrease in emissions as a result. About half of the 33% decrease mentioned before can be linked to these four crises.

Unpredictable events will also occur in the next 30 years, simply because society is a complex system, and a complex system *under stress (!)* can suddenly tip into another state. Such tipping points are now very much discussed in the climate system and are a main reason of concern. But history shows that also in society small events can lead to large and irreversible changes: revolutions they are often called. Crossing tipping points should not always be painful. Greta Thunberg, for instance, has clearly created a revolution. She has been that grain of sand that created an avalanche in the mountain of public awareness (Fig. 2). It came as something totally unpredicted, but it could only happen because that mountain of awareness had been built by scientists and activists in the decades before, piece by piece, steeper and steeper and under ever more stress.

In the coming decades there will be further crossings of social tipping points: new (or old) ideas can go viral (such as, e.g., "value

4. According the International Energy Agency, the COVID pandemic has caused a reduction in global energy-related CO2 emissions of 5,8% in 2020 compared to 2019. But since 2021 these emissions have increased again and have reached record heights in 2022 and again in 2023.

FIGURE 2: Cover of Greta Thunberg's book: No one is too small to make a difference, that caused a landslide in public awareness about climate change 2019.



is more important than price" or "economy is part of ecology, not vice versa"), the financial world might indeed shift investments overnight, and there will certainly be technological breakthroughs. There will also be disastrous catastrophic events, including climate change related ones that can no longer be avoided. When they occur, we need to see also the opportunities to improve, so that the pain is not in vain.

Changing culture

Climate change is an ethical problem, which asks us to answer fundamental Political (with major P!) questions, about how we live on this Planet: among ourselves and with the rest of nature. We are in many to believe that solving the climate crises will require not only scientific knowledge, technological innovations or responsible financial investments, but also a much broader cultural change. Culture is the amalgam of stories and theories, shared by a group of people, that explains and justifies how they live on this Planet. Modern consumeristic culture is by now shared globally, and is based on a narrative that makes us believe that our way of living has nothing to do with climate or nature, that our Technosphere is totally separated from the Biosphere or any other sphere of the Earth System. That is obviously not true, and climate change is the most powerful proof of that. If we really care for all people and everything else that is on our Planet, we clearly have to rethink the relationships between humans and that everything else. We need a globally shared narrative in which respect for everyone and everything is central. For creating such a narrative and bring it down to Earth and real, we will not only need scientists, engineers and entrepreneurs, but all sort of story tellers and educators, Politicians, philosophers, … and last but not least: artists[5,6] (11). Art will not save the world but the world cannot do without art. We are stardust, yes, but we are also "… such stuff as dreams are made of"[7].

These seem like naïve words, especially in current times in which autarchic governments attack the scientific endeavour, attack hardly needed global institutions, and use economic blackmailing and outright violence to impose a totally different narrative (9). These are times that one would easily give up the fight against the causes of climate change and deal instead with the consequences of it, as long and as good as one can, knowing that there is a limit to that.

Still, giving up and doing nothing is not a choice, and if you think of it, it is only in the doing, in the action, that one can maintain a grain of optimism for a better world: pessimism in theory, optimism in practice (12).

This paper is an updated version of the paper "Cambiamento Climatico cinque pezzi facili sui 30 anni passati e su quelli futuri" published in Mediterraneo Dossier #68, p. 14, 2022, Fondazione Girolomoni.

5. In this short video Yuval Noah Harari explains with lucidity that to build an atomic bomb, you do not only need to know the physics (E=mc2), you also need a powerful story to make people believe that it is worthwhile to actually build it. It is exactly the same with solving the climate crisis (https://www.facebook.com/reel/1128761595336572)
6. Artists can be "truth-tellers and mirror holders, emotional translators, visionaries and hope weavers, cultural memory-keepers, challengers of powers, bridge builders, nature's ambassadors and community catalysts", i.e, everything that can be used for changing society and its culture.
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