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State of play of climate action 2024

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Foreword:

This article is part of a series of publications elaborated in conjunction by FTDT and ITDT that are focused in analysing the global landscape in which climate policies are typically deployed, verifying progress made in their implementation -or conversely, the prevalence of persistent stagnation-, as well as considering the critical nexus between national climate action and global climate negotiations towards a fair and effective climate governance regime.

That international system should make available an appropriate framework to foster and facilitate challenging decision making to address elements of the triple global crisis: promote climate action by a diversity of instruments and regulations, pursue sustainability, protect biodiversity, and curtail pollution, both internationally and at the national, the subnational and the local levels, ensuring an integrated approach to a set of complex problems.

However, it is worth noting that the dynamics of global change might include alternative, even somewhat divergent, pathways, and to identify prevailing directions of change and define future pathways for action it is necessary to scrutinize certain subtle clues, detect what at times are almost hidden trends, and be able to extract details of the incipient structural transformations that are not always easy to unearth, while going through the very early stages of the radical transitions underway.

Executive summary

The crises of the climate system and the biosphere underscore the imbalance between human productive, extractive, and polluting activities and the Earth's regenerative capacity. A vast body of scientific research has provided substantive evidence of that polycrisis and of the accelerating transgression of planetary boundaries.

This article initially examines the global environmental landscape, indicates the crescendo of impacts of climate change and the persistent increase of greenhouse gas emissions despite an array of commitments and promises made by individual governments, coalitions, and non-state actors.

The widespread and massive electoral processes in 2024 at the global scale, acting as a likely game changer, foreshadow mutations in the complex landscape of climate action, which are identified, as well as their implications succinctly explored in this first section of the article. Risks and security concerns are also considered, and a link is then established with the potential effects they might have on the behaviour of society and economic agents, providing momentum for action.

The second section extricates a number of insights on the spectrum of signals, data and indicators, including investor's perspectives and litigation drivers, related to ongoing transitions, providing manifestations that change and sociotechnical transitions are effectively underway even at different paces, despite existing barriers that heretofore seemed unsurmountable.

The third part aims to achieve a balanced assessment of fundaments towards a positive narrative, the conceptual basis, and the actual trends, necessarily succinct, but trying to identify the major constituents of a positive rationale for climate action even in a global scenario of increasing fragmentation and geopolitical conflict that comprises key dimensions such as economy, trade, technology, science, and security considerations.

Finally, a section is dedicated to track down the pathways of transition in Latin America and the Caribbean, given the importance of understanding the budding transitions underway in our region.

1. The global landscape

The almost daily barrage of disquieting news on the devastating impacts of climate change throughout the planet is almost inevitably conducive to conclude that the current climate emergency is rapidly aggravating.

Those impacts -actual and projected-, be they extreme storms, droughts, heat waves and wildfires, floods and torrential rains, sea level rise, storm surges, tropical and extra-tropical cyclones, and typhoons, or even the initial steps of the early phase of distressing slow onset events, particularly affecting developing countries, have disastrous effects on lives, property, livelihoods and biodiversity. In addition, they contribute to induce the dangerous amplification of pre-existing stresses (social, environmental, economic, financial) in those countries, particularly in the more vulnerable ones.

The impacts of climate change and hazardous weather are reversing development gains and threatening the well-being of people and the planet, according to a recent multi-agency report coordinated by the World Meteorological Organization (WMO, 2024).

Under these evolving conditions, the future is but desolate, given that human life in the planet is at risk, together with that of a myriad of species, as well as due to the continuous loss of invaluable ecosystems and of exacerbated contamination, unless radical transformations are put in place to avoid a persistence of harm and loss and humanity begins to protect and restore disrupted systems.

Moreover, instead of significantly diminishing as required, greenhouse gas emissions are still increasing, despite variegated commitments, pledges, and plans by governments, large and small, in different regions. According to the most recent research outcomes "global emission reduction efforts continue to be insufficient to meet the temperature goal of the Paris Agreement"[1] (Schleussner, C. F. et al., 2024; Rogelj, J. et al., 2023).

Almost equally fruitless are new promises made in the context of an array of strategies emphatically aired, besides mitigation commitments made by coalitions of diverse agencies, cities, concerned civil society groups, economic actors, financial institutions, international funds, and institutional investors.

Recent reporting on the key critical gaps (emissions, adaptation, and financing gaps) emphatically indicate that the pace of climate action is indeed protracted. In fact, in spite of faster-than-expected progress in clean energy technology deployment, global annual CO2 emissions have indeed increased from 2020 to 2023, even with the Paris Agreement (PA) being in force since the former year.

[1] C. F. Schleussner, et al. (2024). Page 366. Nature 634, 366–373.

Therefore, because of time constraints, the feasibility of limiting warming to 1.5 °C is now seriously contested, conceivably stimulating free rider behaviours in key actors that are significant part of numerous global value chains, or simply inducing extended inaction, with its manifold social, environmental, and economic costs and damages.

Elections as a game changer

Further, 2024 is made singular by a massive electoral process at the global scale, with more than half the world population and about 70 countries having had elections this politically hectic year or having them in the last months of 2024.

Elections taking place encompass several large countries -that are also major emitters-, as well as being heavily populated. Besides there are also elections being undertaken in major emerging economies.[2]

The outcomes of those electoral processes already held comprise some rather unexpected results and imply accentuated uncertainty on the potential implications of these elections on key energy, climate, industrial, trade and health and sustainability policies in the very near future, or even, when looking farther ahead, with effects cropping up even in the next decades.

This potential shift in key policy approaches might occur, even as many governments – most notably in developed countries – are increasingly seeking to shape their economies to ensure competitiveness, for example, through the enacting of industrial policies that comprise the use of tariffs, subsidies, public investment, procurement policies, and more, going against the grain of prevailing mainstream economics and traditional laissez-faire policies.

Those last approaches tend to preclude public interventions to address environmental disruptions, international trade distortions, financial crises, health emergencies or inequality intensification. The orthodox economic assumption is that the market will by itself redress those potential alterations, if any such disturbances were to occur, which again are seen as only temporary.

In addition, the 'far right's crusade', as an expanding political stance, being embraced in numerous countries is set against prioritizing environment, sustainable, and governance concerns and goals, while claiming that the consequent investment strategies in those fields, to address key disruptions, are to be greatly reduced or even nullified. This stance is frequently coupled with the notion that markets function well and can allocate resources efficiently. However, relevant market failures attest to the misconception of that last hypothesis. On the contrary, there are numerous market failures that result in suboptimal economic performance, while climate action, if appropriately designed, might help to diminish the negative effects of these market failures.

[2] See our note: 2024, un año de super-elecciones. FTDT, junio de 2024

Furthermore, the leaders of such far-right political movements are strongly calling for reversing prior efforts to increase ambition in climate action; a demand that might be eventually reinforced by current elections outcomes thus far.

Moreover, conservative views assert that acting on climate change inevitable requires cutting back on other perhaps more relevant government expenditures, with its aftermath of reduced growth, diminished tax revenues to be expected in the future, and, supposedly, the need for larger investments to afford climate mitigation action, thus threatening debt sustainability in the long run and high-priority fiscal equilibrium.

The results from the elections to be held in the remaining months of 2024 might eventually provide new impetus to that particularly unsettling policy stance, with dire consequences for the implementation of policies aimed at solving the triple environmental crisis.

In the case of the US election is, in itself, remarkably consequential in terms of the definitions to be adopted in foreign policy and international cooperation, as well as for the implications on the global climate agenda, through its direct impact on environmental governance, and, notably, for its sequels for global trade, for example through the imposition of blanket import tariffs and the effects of a stronger dollar.[3]

As regards specific US climate action, if there is a second Trump administration, there might be differential impacts of the potential new policies in current climate domestic initiatives, with serious negative effects in EV expansion, investments in offshore wind energy installations, and power plants pollution curbing regulations; methane emissions regulations -via changes in EPA rules- and funding for clean energy investments may also be vulnerable to the likely inevitable policy mutations, while tax credits (granted through the IRA legal framework) and climate funding, with exemptions, subsidies, and funding already largely allocated, may be eventually less affected.

Beyond the direct impact of these potential policy reversals on US greenhouse gas emissions,[4] the major impact is to be primarily reflected on the behaviour of economic agents -investors, developers, financial entities, technology providers- whose decisions shape the socio technical transitions, particularly the energy transition. These effects will not be limited to the US, as, in all likelihood, they will ineluctably propagate to the international landscape, stimulating delay or inaction at the global scale and free riding attempts by other relevant stakeholders.

[3] Former President Trump indicates that he will be introducing tariffs as the tenet of a radical plan that would eventually reshape the US economy. The proposal would enforce a 60% tariff on goods from China and a 20% tariff on everything else the United States imports. His vision for tariffs would turn back the clock nearly a century, echoing the protectionist Fordney–McCumber Tariff of 1922. This protectionist approach could have a significant impact on world trade dynamics and the overall economic landscape.

[4] US greenhouse gas emissions are significant, as the country is the second largest emitter, and in 2023 US emissions accounted for 11.3% of total global GHG emissions.

In addition, the economic dimensions of global macroeconomic, trade and cooperation policies are being to an increasing extent gripped on a global scale by strategic security concerns.

Hence, some of the economic instruments being typically proposed to stimulate overall sociotechnical transitions, such as global carbon pricing, may be eventually rendered sterile in this context.

Notwithstanding that potentially problematic evolution in the climate stance of key Parties in the United Nations Framework Convention on Climate Change, on the other hand there is growing evidence that there are considerable behavioural shifts in societies and communities, besides enhanced perceptions, as well as more accurate insights by economic agents, on the hazards posed by climate change impacts and its dire consequences on economic activities.

Risks and security concerns

This behavioural transformation takes place as the improved understanding of climate change multiple and concurrent risks, as well as the rich gamut of new business opportunities -resulting from robust climate action at large and accelerated technical progress-, are made progressively mainstream, once the political, social, and economic implications of those potential opportunities are properly accounted for.

Simultaneously, the effects of climate impacts on diverse essential natural systems and the ecosystem services they provide, grow more severe, more extended, as well as more visible, due both to their own significance and to the extreme harshness of their multifaceted consequences, globally and locally.

Thus, those effects are adding to the process of increasing awareness -by society and by economic and financial players- of rising climate risks, damages and earth system negative tipping points, that will jeopardize both livelihoods and prosperity, and also hamper the more traditional business and financial models.

In addition, there are energy security considerations, driven once more by the last global energy crisis, that helped to underscore the implicit vulnerability of the present fossil fuel-based global energy system, that is essentially impervious to change.

Moreover, the understanding of the effects of that recent crisis on overall prices and family incomes, paved the way for a more rational examination of the benefits of, inter alia, rapidly expanding renewable energies, the consolidation of green hydrogen production, and of fully unfolding energy efficiency in its extended and multipronged modes of materialization.

Further analysis can provide inputs to consider initiatives aiming at diminishing the vulnerability of the energy system and help to alleviate the concomitant socioeconomic impacts, as well as the costs of energy transitions.

In a similar direction, there are growing concerns about food security, with current food prices impacted by climate volatility, decreasing yields in some regions, and disruptions in global production volumes, due to altered climate patterns.

In addition, when considering food security, variations in the CO2 fertilization effect (CFE), in the longer term, introduce a measure of uncertainty regarding future global agricultural yield projections (i.e., in rice and wheat). These conditions might further widen the gap in productivity between middle-to-high-income and low-income countries from the 2030s onwards, under elevated carbon dioxide concentrations in the atmosphere, and higher temperatures. In the case of rice, while global production is expected to rise in the 2050s, significant variations between rice subspecies and the influence of global warming introduce a measure of uncertainty in projections relative to the current baselines. For wheat, also one of the major food crops globally, increased atmospheric CO2 concentration is expected to have an impact on crop production, enhancing crop growth, while results from modelling indicate that at high temperatures the CO2 benefits are reduced, and there is increased uncertainty related to yields (Asseng et al., 2013).

Furthermore, climate critical thresholds are made closer as time elapses and inaction persists, increasing the level and modifying the nature of overall risk, as well as of the likelihood of reinforcing loops. These conditions shore up the need to underscore the urgency of action.

The more accurate understanding of the threats posed by climate change impacts to, inter alia, food and energy security, urban areas, livelihoods, and public health systems -especially those in large cities-, may indeed be classed as eminently negative, while scientific evidence highlights the need to expect and prepare for earlier and more severe and extended climate effects.

A relevant example is provided by an analysis of global risk amplification due to climate impacts. Research undertook concluded that risks increase in most countries under future climate change. One particularly thought-provoking conclusion is the one that indicates that, for example, the US will face a bigger rise in weather-induced supply disruptions over the next 15 years, than any other country, globally, even if present risks to consumers are currently by contrast relatively low (Quante at al., 2024).

Nonetheless, an enhanced comprehension of the combined current climate and biodiversity crises, is operating instead as one of the driving forces for transformative action.

This shift occurs, in particular, in the case of non-state actors, given that a more thorough appraisal of the economic and social implications of climate impacts, biodiversity loss and exacerbated pollution, provides a more accurate and comprehensive insight of the severe disruptions that they may cause to society, to the entire economic structure of a country, and, significantly, to the financial systems in place.

Moreover, there is a widening realization that the required efforts to be made on climate action and nature conservation are in fact an investment, not an extraneous cost to be detracted when estimating future project returns -a key indicator for investors-, and that those actions are indeed essential for creating a sustainable, resilient, and inclusive economy over the next decades.

The levels of investments needed are nonetheless significant and would require a strong participation of the private sector in financing the transitions. According to the UN's standing committee on finance (SCF), in a recent report that "evaluated the costs required by 98 developing countries to enact their climate plans", the SCF found that, considering the need for financial

resources since 2015, as much as $6.9 billion in total may be required by 2030, while a bigger share of that amount might need to be mobilized by the private sector to achieve the required results.

In the next section we briefly explore a cluster of signals and information, reinforcing the notion that the proactive behavioural shifts we mentioned above are progressively intensifying, contributing to create the proper enabling conditions (political, social, economic) for a radical mutation of the prevailing paradigms, as well as superseding the dominant styles of development, that are increasingly perceived as unsustainable.

2. Change is underway: signals, data, indicators

There is an array of signals and indicators that sociotechnical transitions are underway, even if those transitions are in some cases only incipient, or just going through the first phases of their long and challenging road towards eventual materialization by mid-century.

The global stocktake is a process under the Paris Agreement for countries and stakeholders to verify whether they are collectively making progress towards meeting the goals of the PA, – and indicating where they are not, providing thus an overall panorama of the state of climate action and an assessment of progress made towards agreed goals.

The first global stocktake of the Paris Agreement (GST-1) concluded at the UN Climate Change Conference (COP28) in December 2023 with the adoption of a decision. By Decision 1/CMA.5, the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, in paragraph 18, "[a]**cknowledges that significant collective progress towards the Paris Agreement temperature goal has been made**, from an expected global temperature increase of 4 °C according to some projections prior to the adoption of the Agreement to an increase in the range of 2.1–2.8 °C with the full implementation of the latest nationally determined contributions".[5]

In addition, paragraph 20 "[c]ommends the 68 Parties that have communicated long-term low greenhouse gas emission development strategies and notes that 87 per cent of the global economy in terms of share of gross domestic product is covered by targets for climate neutrality, carbon neutrality, greenhouse gas neutrality or net zero emissions, which provides the possibility of achieving a temperature increase below 2 °C when taking into account the full implementation of those strategies."[6]

However, in its decision the CMA also "[n]otes with significant concern that, despite progress, global greenhouse gas emissions trajectories are not yet in line with the Paris Agreement

[5] UN FCCC/PA/CMA/2023/16/Add.1.

[6] UN FCCC/PA/CMA/2023/16/Add.1.

temperature goal, and that there is a rapidly narrowing window for raising ambition and implementing existing commitments in order to achieve it"

According to a report by the Transitions Pathways Initiative, globally, 30% of the biggest corporate emitters have long-term (2050) climate targets aligned with 1.5°C. The report bases its analysis on the Carbon Performance Assessment of 409 companies and the Management Quality progress of over 1,000 of the world's highest-emitting public companies (TPI, 2024). Since 2020, the share of companies with long-term (2050) emissions targets aligned with 1.5°C, has increased fourfold, from 7% to about 30%. In addition, the majority (57%) of the companies analysed operate at what is defined as Level 3, which specifies that companies have moved out of the laggard range, and "have recognised climate change as a relevant business risk and/or opportunity, developed a policy commitment to act, set some kind of emissions reduction target, and disclosed their Scope 1 and 2 emissions".[7]

When analysing carbon performance, that same report indicates that the sectors most aligned with the 1.5°C or below 2°C goals are the following: diversified mining (50%), steel (46%) and electricity (41%). The least aligned are food producers (8%) and oil and gas companies (6%). From a regional perspective, in China, 82% of companies are either not aligned or lack suitable disclosure of relevant information, while the highest alignment with 1.5°C or below 2°C in 2050 is observed in European, Australasian, and Japanese corporations.

Furthermore, the plausibility of long-term climate ambitions announced by firms is "often unclear, with many of the companies lacking intermediate targets and clear quantifications of the key elements of their climate strategies" [8], which eventually acutely confines the extent of their commitments in practice.

Positive tipping points

From a different perspective, when considering the diverse indicators of transformational change, it is worth underscoring that there are ongoing processes by which the occurrence of positive tipping points (PTP) is accelerating. Tipping points take place when a set of conditions (typically related to costs, prices, and technological change) coalesce at a moment in time thus enabling new technologies "to out-compete incumbents", as characterized by Stern (Stern, 2024). The triggering of those tipping points can eventually lead to inordinately large, as well as rapid beneficial results in mitigating climate change.

Positive tipping points span multiple domains of technology, politics, economy, and social behaviour. They can occur in different sectors or areas (that are relevant sources of GHG emissions) and are undergoing processes of technological change, such as electricity, light road transport,

[7] TPI Centre (2024). 'State of Transition Report 2024'.

[8] TPI Centre (2024). 'State of Transition Report 2024'.

trucking, aviation, shipping, fugitive emissions, heating in buildings, hard to abate industries -including steel, cement, and chemicals-, food and agriculture, and land use change (Systemiq, 2021).

Progress to be achieved in carbon solutions maturity, as it evolves from concept to solution development, to niche market, then to mass market and finally to late market, proceeds along this sequence, enabling scalability and accelerating system change. Market tipping points occur when it is feasible to move on from niche market to mass market. In addition, research suggests that technology progress is significant, but represents only one facet for a system to tip (Mey et al., 2024).

Technological tipping points, for example, are starting to effectively occur now more frequently and rapidly in energy systems (i.e., in solar and wind energy), such as in achieving cost parity for renewable power generation. or realizing decreases below new coal and gas costs, even if these tipping points might have taken -in some cases- a few decades to emerge. Additionally, positive tipping points are close to occur across several other systems and technologies, such as BEVs and heat pumps (BloombergNEF, 2023).

Investors and financial entities: a landscape of risks and opportunities

Investors around the world have been increasingly focusing on the material financial impacts of climate change to the companies they invest in, the multifaceted risks to their portfolios, as well as on the array of opportunities for new investment in innovative climate solutions and nature-based solutions in each asset class.

Benefitting from science-based information, producers, and investors, are increasingly able to formulate and appraise transition plans and disclose present and expected risks related to their economic activities, assets, and portfolios.

Transition planning provides a useful blueprint for long term strategic delivery, oriented to be part and accomplish sociotechnical transitions, while full disclosure may furnish investors with the robust information that they need to fully engage in financing the ongoing transition at the speed and scale required.

To support the efforts to formulate and implement transition plans towards net zero, for instance, the European Union and the UK were beginning to implement the Corporate Sustainability Reporting Directive (CSRD) and the Transition Plan Taskforce (TPT) Disclosure Framework. Since it was launched in 2023, the TPT Secretariat has already engaged with many jurisdictions regarding transition plans to inform their own approaches to this challenging endeavour, including countries in quite different regions, such as Australia, Brazil, Canada, Ghana, the European Union, France, Germany, Hong Kong, Japan, Malaysia, New Zealand, Singapore, Thailand, the United Kingdom, and the United States.

Further, globally, more than 14,000 non-state members have joined the Race to Zero's Partners since its inception in June 2020, an initiative representing over 9,000 companies, 600 financial institutions, 50 regions, 1100 cities, 1100 educational institutions, 70 healthcare institutions and 30 other organisations, with the aim to collectively halve global emissions by 2030.

In addition, other voluntary initiatives, such as the Glasgow Financial Alliance for Net Zero (GFANZ), are progressively turning commitments into climate action, albeit at a slower pace than pledged.

In a similar direction, the U.S. Treasury Department issued in 2023 its Net Zero Principles for Financing and Investment, which establishes that financial institutions' net zero commitments should be in line with the Paris Agreement goal of limiting the increase in the global average temperature to 1.5 degrees Celsius to avoid the worst impacts of climate change.

In addition, there are several initiatives related to climate scenario analysis, which is a useful tool in assessing climate-related financial risks, due to significant uncertainties primarily associated with climate change and biodiversity loss, as mentioned before.

Those risks can impact financial stability (a macroprudential view), can impinge on financial institutions (a micro prudential view), as well as changing conditions for insurers. These conditions provide a clear signal to the financial sector that it should be looking in-depth to understand climate change dynamics and elaborate tools and put in place procedures to reduce vulnerability and integrate transitional and physical impacts in their business models, in portfolio planning, in structuring innovative financial instruments, as well as in adapting cost structures to include those incremental impacts.

Another example that showcases the implicit dualistic nature of the nexus "commitments – action" is revealed by financial entities' current proclaimed efforts in financing the sociotechnical transition. It is now abundantly clear that banks should play a key role in this transition.

While acknowledging that financial entities are gradually committing to support the low-carbon transition and making "net-zero emissions" efforts financially feasible by 2050, as well as adopting net-zero commitments to that end, different analysis show that they are not always on track to achieve that goal.

This drift of financial entities vis a vis their commitments is caused by the fact that pledges made by commercial banks are not being equally ambitious across different entities, nor being adequately aligned with the sectoral decarbonization pathways of the firms that comprise their lending or investment portfolios, or just because they are still providing far too scarce green financing, as compared to the amounts of fossil fuel financing being recorded in their current portfolios.

This may to some extent be occurring because even if banks have started examining more closely and measuring climate risks and expressing their willingness to move towards net-zero, they are yet not fully adjusting completely their business models to take into account the dire physical disruptions looming ahead, as their clients, their lending portfolios and the entire economy get impacted by risks and damages, and almost all economic activities might be disrupted by climate extreme events.

According to a study by Climate X, a climate risk data analytics firm, in conjunction with Climate Proof, there is a significant gap in preparedness, with 88% of the fifty world's largest commercial banks failing to adequately address climate adaptation risks.

That analysis, based on climate adaptation maturity (that was evaluated across 17 key indicators), concludes that large commercial banks, despite increasing awareness of increasing climate risks, are still not moving decisively in implementing robust climate adaptation strategies to address those risk.

The predicament of insurers and reinsurers and the need for climate action

The insurance industry is facing the pervasive risks of climate change that are transforming the global risk landscape, which represents the baseline for their activities. This is occurring through warmer average temperatures, rising sea levels and storm surges, frequent and extended heatwaves, widespread wildfires, intense rainfalls in shorter time periods and increasing floods, and weather extremes, such as hurricanes.

A new era of climate-intensified disasters is thus drastically challenging the business models of the insurance industry. For example, existing flood maps (where they exist), which designate high hazard areas, are frequently outdated and do not accurately register the risks of extreme weather events.

In fact, floods and flash floods are underestimated natural hazards that cause losses worldwide in the order of US$ 320bn, of which roughly US$ 56bn was insured (Munich Re, 2024).

Further, most catastrophe losses, including the significant consequences of climate impacts, are not covered by insurance. Hence, millions of households and businesses at the global scale are exposed to a large and ever widening protection gap. This gap refers to the difference between insured and uninsured losses. According to Swiss Re, the gap is higher in Asia and Latin America and the Caribbean (Swiss Re 2024).[9]

In addition, according to Munich Re, there is a trend toward increasing insured losses that is being driven particularly by non-peak perils, including severe thunderstorms, tornadoes, flooding, and forest fires. That trend in insured losses is closely linked to incrementally exposed assets. Extreme hurricanes are one of the major natural (climate) events, responsible for the significant volatility in the scale of losses of the insurance industry. Tropical cyclones, known as hurricanes, typhoons or cyclones depending on the particular region in which they occur, have an increasing destructive potential and account for the highest losses over time (Munich Re, 2024).

On an interlinked pathway, catastrophe bond investors currently face extremely high losses due to hurricanes. Catastrophe bonds, a high-yield debt instrument that is designed to raise money for companies in the insurance industry, allow capital market participants to invest into insurance event risk, such as tropical cyclones. They are issued by insurers and reinsurers to provide financial protection against the most severe natural disasters. Catastrophe bonds have shown low correlation to traditional financial markets. Large gains are likely if a predefined event does not occur.

[9] The protection gap also includes seismic events.

Conversely investors can lose a large part of their capital if the event occurs, and the level of those losses is also associated to the severity of the event.

Given this overall panorama, the insurance industry (insurers and reinsurers) has indicated that it is working to reduce the causes of climate risk, by inter alia providing support to the energy transition and then, specifically, insure what cannot be mitigated. This includes not only reinforcing climate risk management, but also assisting the efforts being deployed in the transition to a net zero economy. Both activities require specialized risk expertise and a disciplined approach due to higher uncertainty related to climate risks and hazards.

Multiple threads and pathways towards transitions

Moreover, in another example of the ongoing processes of unavoidable adoption of favoured sustainable pathways, the World Economic Forum is advancing the concept of a 'nature positive' world, including elucidation of the evolving role of board directors of companies, large and small, in implementing what it calls the 'emerging vital strategy for businesses across the world economy'.

From an entirely different perspective, showing another distinct thread in the complex fabric of transitions, there is a slowdown in oil demand growth, that is down sharply from the rates observed in recent years, amounting to less than half in 2024 and 2025 against increases in 2023, when measured in barrels per day, according to the recent Oil Market Report (IEA, 2024).

That decline is primarily due to significant changes in the Chinese economy, which is slowing down from the rapid rates seen in previous decades, partially related to a weaker overall demand and the expansion of electric vehicles. It is worth noting that China has been driving growth in global oil demand this century.

Hence, it may be necessary to consider whether this current trend, defined by the prevailing sluggish demand for oil, is part of what is to be typified as a temporary rebalancing of markets in the near to medium term, or if it obeys to a tectonic change in fossil fuel consumption driven by technological progress and shifting patterns in consumer behaviour, among other deep-rooted transformations.

As an example of the impact of the incipient expansion of EV vehicles in different regions, even if unique because of its circumstances, in Norway electric cars now outnumber petrol cars for the first time in history, with diesel models sales falling rapidly (OFV, 2024). This puts Norway on track towards taking fossil fuel vehicles off entirely the road, in line with Norway's climate commitments, that include a target for all new cars being sold to be zero emission vehicles.

In addition, another example of positive signs relative to the ongoing energy transition is new solar capacity being installed at the global level, with a record-breaking estimated 593 gigawatts (GW) in 2024, up 29% on 2023 levels, and nearly six times the amount added five years ago. This growth is not only limited to China, Europe, or the US, but also includes in 2024 new markets, such as Pakistan and Saudi Arabia (Ember, 2024).

Nevertheless, in the near future there might be visible instances of backsliding in the efforts towards full implementation of the ongoing transformational pathways, as a consequence of the changes

brought about in high level political stances defined by the previously held or because of the next -just around the corner- elections.

One relevant example of setbacks potentially invalidating previous pledges is that ongoing around the important text that was being debated under the TF-Clima group (as the climate taskforce is known) to be considered in the next G20 meeting in Brazil. The leaders of the G20 countries will meet on 18 and 19 November 2024.

The pledge to "transition away from fossil fuels" was certainly one of the most important commitments to emerge from the COP28 climate summit in Dubai last year. In the most recent draft of paragraph 5 of the communique being now discussed -where the commitment appeared in the first draft- there was yet no reference to "transition away" (as in the initial version).

That G20 countries might be unwilling to come through on their responsibilities to rapidly divest from harmful fossil fuels; this stance should be considered as a serious step back on previous declarations and, essentially, an indication of the lack of sturdy political will (at least of part of its members) to push towards a more ambitious stratum of climate action, even if it is only a short-term indicator solely relevant in the very near future.

Litigation as a new driver

In a different context, the number of cases filed against fossil fuel companies each year has nearly tripled since the Paris Agreement was reached in 2015, according to a new report "Big Oil in Court – The latest trends in climate litigation against fossil fuel companies" by Oil Change International and Zero Carbon Analytics.

Lawsuits have been filed against the world's largest oil, gas, and coal producing corporations, with about 40% of the cases involving claims for compensation for climate change damages linked to fossil fuels, as part of a escalating wave of climate litigation.

More cases are being filed against corporate actors, with a more complex range of legal arguments, while growth in what is termed "climate-washing" cases, challenging the accuracy of green claims and commitments made under a conspicuous green aegis has been observed in growing numbers.

Cases seeking financial damages' compensation in courts are also challenging disinformation provided by firms, with many of those cases relying on consumer protection laws (Setzer and Higham, 2023). Finally, given these trends, high-emitting activities and value chains are now more likely to be challenged at different points throughout their entire lifecycle, from initial financing to final project decision.

It is worth noting that effects of litigation initiatives at the global landscape, reveal this new kind of emerging risks associated primarily with legal responsibilities created by governmental or corporate decisions to uphold direct inaction or simply to foster climate delay.

However, in spite of the drawbacks previously identified in the process of climate negotiations towards an international governance regime, as well as in ensuring that climate commitments adopted by governments at the national level are then effectively complied throughout the economies, it is still possible to conclude that the inexorable mutation of the currently prevailing

paradigm of unsustainable growth is already under way, and that it will intensify, even amidst the present harsh global geopolitical clash that might indeed increase in the next years.

That mutation is essentially related to driving forces that operate to same extent beyond the complex weave of international multilateral negotiations, and of the efforts presently being made at the intergovernmental level to build new architectures for collective action and setting up coalitions to address urgent environmental challenges. We will examine those drivers in the next section.

3. A balanced assessment of fundaments towards a positive narrative

The powerful driving forces that allow us to infer that real progress is being made in the implementation of sociotechnical transitions towards net zero, include a set of heterogenous drivers, operating in different critical dimensions.

In many cases, those evolving trends are not altogether explained or were exclusively fostered by governmental policies, even if their inception and subsequent development has been initially propelled by the steady construction of a global regulatory framework under the UN climate regime and by the introduction of broader in scope and increasingly more sophisticated policies and measures by national governments, at least in the last two decades.

A growing body of research (comprising both meta-analysis and exhaustive surveys of available literature) shows that mitigation policies have had a demonstrable impact on emissions, as well as on diverse emission drivers, even though current global carbon dioxide emissions are however 60% higher than they were in 1990.

In this context, following Stoddard et al. (2021), it can be asserted that humanity has failed, up to now, to "bend the global emissions curve", as well as has not been able to do so in the appropriate cooperative manner, that is doing so within the UN multilateral system and its principles and modalities.

Hence, negotiations being undertaken in the international system are oftentimes deemed as ineffective, and there are, to an increasing extent, calls for different, supposedly more effective approaches, as well as some radical proposals that largely exceed the foundations of cooperative approaches.

However, research also shows that the last two decades have witnessed a progressive increase in the number of mitigation policies enacted by governments to reduce greenhouse gas (GHG) emissions, even if those emissions have continued to rise.

Primarily, those policies have led to reductions in energy use, decrease in deforestation rates (even if with a measure of variability in the decadal rates of deforestation and forest degradation that is more evident across regions), as well as have propelled significant cost reductions and large capacity expansions using low-carbon technologies.

Indeed, the slowdown in emissions growth has been strongly associated with technological innovation, an ensemble of specific regulations, and with more sophisticated climate policies, either combined in a robust regulatory force or acting separately, according to national circumstances.

As an element to integrate into a balanced appraisal of progress made, it is worth noting that while emissions have continued to rise and, globally, insufficient progress has been made to keep warming below 1.5°C (the more ambitious dimension of the global mitigation goal of the PA), the rate of growth of emissions has nowadays diminished.

Hence, it can be asserted that efforts to mitigate climate change -and consequently the outcomes of climate action put in place- have reduced emissions compared to a world entirely without climate policy.

It has been made clear empirically that identified risks call for more science-based climate action, rather than avoiding it, or simply delaying forging ahead with the required efforts, which is evidently an entirely unrealistic strategy, given the major climate threats that make protracted action so dangerous. In fact, the hazards associated with climate change contribute to the rationale that further substantiates the notion of a positive narrative for climate transitions and sustainable growth.

Furthermore, there is a substantial body of research, sound, scientifically robust, and wholly capable of formulating economic policies that are conceived to address quandaries linked with complex systems in the real world.

The actual world is, in fact, one that is suffering a composite of crises (climate, biodiversity and pollution crises, and water distress, as well as poverty), and thus is suffering the multiple adverse and persistent effects of the unsustainability of current growth pathways and of our current economic theoretical approaches, methods and models.

To tackle the triple environmental crises and do it with the urgency required, there is a need to attain rapid structural and systemic change, at the scale called for, while aiming for equitable, inclusive, and resilient growth.

However, current analytical economic frameworks -that can be assumed to belong and be an outcome of conventional wisdom- are inadequate, increasingly so, to comprehend the full extent of climate risks (and its dynamic evolution), and to allow formulate the requirements and devise the instruments to undertake systemic and structural change, as needed (Stern and Stiglitz, 2023). In addition, in existing models, technological progress and growth are exogenous and basically extrapolated from historical trends, hence typically underestimating the extent and pace of technical and structural change and, eventually of actual accelerated cost reductions (Way et al., 2022) and the possibility of early (before 2030) positive tipping points in key technologies (SYSTEMIQ, 2023).

A distinct piece of the misleading orthodox theoretical construct is the assumption that addressing climate change will inevitably entail a high cost for the economy, detract from overall prosperity, and that it will be particularly harmful for the private sector, eventually hindering long-term

perspectives of growth and being detrimental to livelihoods, to the point of vindicating the rejection of the need for climate action in its entirety.

Without going in detail into the gamut of analytical flaws ensconced in the orthodox analytical economic frameworks, being typically applied to justify discourses of delay or simply to deny the need for climate action, they are primarily premised on potential projected economic losses resultant from that action.

Contrariwise it is possible, even imperative, as well as worthwhile, to identify the major drivers of an ongoing transition that by itself negates on the ground conventional wisdom and shows the distinct possibilities of sustainable growth and the opportunities for practicable transformations provided by climate action.

The major drivers of the sociotechnical transition under way comprise an array of technological, economic, industrial, and strategical forces, as well as encompassing the power of the societal momentum created both by the ever-expanding awareness of climate impacts and their associated risks, and by the concrete impacts on society, environment, and economic assets and activities, alongside those adverse effects damaging infrastructures.

When analysing the major forces making required transformations economically and financially feasible, even propelling them, and also politically sensible, research identifies key driving forces that include: i. improved resource and energy efficiency, realizing still available efficiencies and shifting towards the production frontier; ii. Increasing returns to scale in innovative technologies and production (with accelerated and significant cost reductions, as verified in PV and wind turbines), as well as in critical networks (i.e., electricity grids, public transport)); iii. systemic changes enhancing system productivity (i.e., in energy, cities, transport, land use); iv. shifting frontiers of knowledge in line with societal priorities; v. positive implications of significant investment increases required for a rapid and comprehensive economic transformation with opportunities for scaling up sustainable investments, in a global context of weak investment rates throughout the 2010s, low planned investment, a persistent gap in infrastructure investment and the world economy operating below full employment; vi. reinforcing effects of international coordination; vii. improved health (labour productivity and lower costs of care) and reduced burden of disease; and, viii. behavioural change (Stern and Stiglitz, 2023; Lankes et al. 2023).

From a purely macroeconomic perspective, the sociotechnical transitions are being deployed at a point in time, when, because of the relative weakness of global aggregate demand (IMF, 2024; World Economic Forum, 2024; UNCTAD, 2023), as well as due to vigorous innovation processes being deployed in key technologies as well as an unleashing of energy policies (IEA, 2024), the opportunity costs of robust climate action may be low, while, conversely, benefits of those actions might be relatively high (Stern and Stiglitz, 2023), thus further reducing the overall costs to society and the economy of those transitions.

In addition, research results indicate that integration of multiple socioeconomic-technological transitions, including lowering energy demand, shifting to an environmentally friendly food system, strengthening energy technology progress, and providing stimulus to capital formation,

would be effective in reducing upfront costs and diminishing overall transition costs in the different systems.

This is an issue particularly relevant when considering in depth the complex national circumstances in numerous developing countries -including high indebtedness, scarce fiscal space, insufficiency of funding-, as well as the relatively high cost of capital that impinges on massive investment efforts in the Global South.

Furthermore, the costs of inaction are large and increasing with delay. According to the Climate Policy Initiative estimates, the social and economic costs to be incurred under business-as-usual scenarios might be as high as USD 1,266 trillion.

4. LAC in action

These reflections could not be entirely comprehensive if, when looking at the critical issues we have previously considered, from a Global South perspective and, more specifically, from a Latin American and Caribbean (LAC) viewpoint, there is not at least a reference (even if very succinct) to cases underscoring climate action taking place in LAC.

The focus will be placed, in particular, on the mitigation efforts being made all across this vital, vast, and resource and biodiversity rich region, in spite of the diverse obstacles that need to be removed when implementing climate action, that are indeed similar as those found throughout the Global South.

It is worth noting that at least eleven Latin American and Caribbean countries have pledged to achieve carbon neutrality (Lang et al., 2023) most of them by 2050; further, the region has the cleanest electricity mix in the world, as close to 60% percent of its electricity comes from renewable sources, mainly hydropower.

However, hydropower generation is at risk due to climate change (OECD, 2022). So, at the same time, countries in the region are also increasingly considering investing in natural gas to support economic growth and, specifically, be able to provide firm energy when severe and extended droughts and even widespread floods threaten the reliability of available hydro sources.

Latin America total installed electrical capacity from all sources amounts to 457 GW (IRENA, 2022), while energy demand is projected to increase in the region in about 80 % by 2040. There is a need then to expand installed capacity, increase the share of renewables even further to comply with commitments, and address climate risks associated with the entire energy infrastructure.

To that end, there are plans in the region to grow its large scale solar and wind power capacity by more than 460% by 2030, vis a vis the 69 GW (27.6 GW solar, 41.5 GW wind) currently operating. This planned expansion of solar and wind capacity (about 319 GW) is to be achieved through projects that are currently either announced, in pre-construction or under construction.

If all these initiatives were to be finally materialized, it would embody around 70% growth over Latin America's current total electrical capacity from all sources which stands at 457 GW (IRENA, 2022; GEM 2023).

By comparison fossil fuel planned capacity in the region has diminished by 47% since 2019, mainly due to the cancellation of projects, both coal (50%) and gas (40%), compared to only 32% of renewable energy projects (GEM, 2023).

Brazil, Mexico, Chile, and Argentina currently head the statistics on wind and solar installed capacity, with a collective operating capacity of more than 61,8 GW. Notwithstanding that, currently Brazil, Chile and Colombia lead the transition towards utility-scale solar and wind generation in Latin America and, more specifically, are the drivers behind the solar push as well as some of the region's largest economies.

Thus, nowadays, countries in Latin America and the Caribbean have the largest solar power development pipeline outside Eastern Asia and North America.

The region is constructing over four times the amount of solar capacity being built across Europe, and nearly seven times more than in India, the world's third largest solar producer (GEM, 2023).

Brazil has reached 15 GW of operational capacity in large solar plants and expectations include reaching a total of around 33,2 GW in 2024. According to the National Energy Balance (2024), solar energy generation increased by 51,1% in 2023, attaining a share of 1,7% of the total energy matrix in the country. In terms of energy generation, the increase in that year, as compared with 2022, was 68,1%. Both solar and wind energy played a significant role in maintaining domestic offer in times of hydric stress. If only the country can sustain its current rate of growth in the deployment of renewables it could reach a two-fold increase every two years (ABSOLAR, 2024). The reasons behind this outstanding expansion are the sizeable reductions in initial investment and equipment cost, tax exemptions for imported equipment, and subsidies applicable to solar projects, that resulted in diminishing costs for the installation of solar rooftops and allowed to enhance distributed generation.

Another example of the ongoing shift towards renewables in LAC is that of Barbados. The country plans to have a hundred per cent of its energy consumption supplied by renewables by 2030, including solar (residential and commercial supply), predominantly offshore wind energy, biomass, waste to energy, and wave kinetic energy. The rationale for this shift to renewables is primarily economic, given high costs of energy (based in the use of crude oil), the impact of fossil fuel imports on the external balance, and concerns over energy security.

The energy transition is taking place in LAC despite the economic risks associated with that process, including among those potential exports' losses and reduction of fiscal revenues (and, consequently, fiscal space) resulting from decreasing production of fossil fuels and the possibility of new waves of investments shifting progressively to renewable energies.

In addition, the public sector still preserves a relevant role in fossil fuel production in several countries in the region, sometimes even counterbalancing the efforts being made to expand renewables to comply with climate international commitments, as well as with national plans in place.

Similarly, there is a dynamic tension in the region between land use change propelled by deforestation and forest degradation, agricultural intensification, and livestock production shifts

(and its associated GHG emissions), and the potential loss of fiscal revenues and foreign exchange gains resulting from increased production and exports in the relevant value chains.

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