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On Record

Political Temperature and the Temporalities of Climate Change

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The year 2020 tied with 2016 for the warmest ever recorded for the planet, concluding a decade that was the hottest on record.[1] The 2010s also included multiple record-breaking years for the earth's average temperature, as estimated by the scientific institutions that process vast amounts of meteorological data recorded around the world to produce a global mean surface temperature (GMST).[2] Since the 1980s, when what are today the three primary keepers of the instrumental temperature record were established, the idea of a singular GMST has helped underpin climate crisis discourse, providing a benchmark and frame of reference for anthropogenic disruption to the climate system as well as a baseline for political temperature targets.[3] The 2°C target in particular has become a dominant feature of climate policy since it was adopted at the COP 15 meeting of the United Nations Framework Convention on Climate Change (UNFCCC) and inserted into the 2009 Copenhagen Accord. The target was further enshrined as the goal of international climate negotiations in the 2015 Paris Agreement, which called for "holding the increase in the global average temperature to well below 2°C above preindustrial levels and pursuing efforts to limit the temperature increase to 1.5°C above preindustrial levels."[4]

Temporality is embedded in the political temperature target, although somewhat opaquely, as it is meant to keep the earth from warming no more than 2°C above the ambiguous aforementioned "preindustrial" baseline temperature. This figure is presumably derived from one or more of the time-series records, which are not specifically mentioned as such in either the Copenhagen or Paris pronouncements. Even though the expression "on record"—as in for example "the hottest year on record"—seems to suggest a unified climatic record with a single, linear temporality, various estimates of past global temperatures have been comprised through different means of measurement at radically divergent timescales. For example, 800,000-year-old ice core proxy data extracted from Antarctic ice sheets is, through the concept of a unified climate record, synchronized with the instrumental data of thousands of thermometer readings from terrestrial and marine installations positioned across the planet that have been averaged into monthly and annual temperature anomalies. The elaborate reconciliation of alternate timescales from different traditions, methodologies, and disciplines has created a new kind of governmentality of temperature, bringing the distant past and the future of the earth's climate into the domain of the governable.

Climate crisis discourse is further saturated with an array of auxiliary records that support perceptions of extraordinary changes in the climate system, which, like temperature, have an intrinsic temporal component: "record-breaking" droughts, hurricanes, wildfires, and floods, for instance, or the minimum extent of Arctic sea ice—a record based on satellite data that despite only extending back to 1979 has drawn significant media attention.[5]

The evolution of 2°C as a political temperature target has attracted great interest from a wide range of scholars as well as journalists.[6] However, similar to the lack of direct reference to particular temperature records in, for example, the Paris Agreement, the temporal aspect of the target—the long-term time-series data upon which change is tracked over time—is often taken for granted and not explicitly considered as an essential component of climate governance in histories of the 2°C target. This chapter hence aims to highlight and historicize the multiple layers of temporality that underpin political temperature targets and the wider contemporary discourse surrounding climate change. In line with scientific terminology and measurement practices, we distinguish two categories of records—proxy and instrumental—that not only, as alluded to above, operate on vastly different temporal registers, but also serve certain scientific and political functions.[7]

Drawing from Reinhart Koselleck's distinction between the historical (what is normally perceived as human history), and the metahistorical (natural conditions beyond the impact of human activity), we trace the emergence of different temperature records as the process of translating the metahistorical into the domain of the historical. This process was intertwined with new representations of temporal change, as the vertical, stratigraphic form of representing time—visible in ice cores for example—were enrolled in the horizontal spatiality of timelines and climate graphs. The act of *recording* temperature became, in a world with an increasingly complicated relationship between human and natural timescales, a practice that operated on multiple temporal levels and moved the global average temperature into the domain of the governable.[8] We conceive of this process, in which global average temperature became a political as well as scientific issue, as the emergence of *political temperature*.

From the Metahistorical to the Historical: Temperature Records and Temporality

The history of the 2°C target and the establishment of a global annual temperature record is messier than suggested by the monolithic number "2"—what Marselleto, Biermann, and Pattberg refer to as a "reductio ad unum."[9] Previous scholarship has shown how the temperature target was coproduced through scientific and political institutions, appearing on the geopolitical stage partly by chance and individual advocacy as well as through the compression of different climate records into a unified number.[10] Despite the rich attention paid by scholars from an array of disciplines to the emergence of temperature targets, the matter of how different timescales and climate records are synchronized and compressed into singular digits is yet to be investigated. The history of political temperature targets and the establishment of standardized temperature records can thus be seen not solely as a history of science and policy but as a process of negotiating different temperature records into a singular timescale of anthropogenic climate change. The concepts of climate science do indeed have a politics of their own, but they could also be said to carry with them implicit temporal understandings, connecting distant pasts to contemporary politics and planetary futures.[11]

As historians have increasingly turned their attention to the social and historical aspects of anthropogenic climate change, temporality has re-emerged as an analytical category in a partly new form.[12] Mark Carey and Alessandro Antonello have argued that environmental historians have mostly been preoccupied with spatial and material elements of the past, while largely overlooking the way time is constructed and temporalities are constituted within societies.[13] In recent years the perceived linearity and unity of climate change temporality, manifested in ice core records, CO_2 measurements, and aggregated global simulations of changes in the earth system, have been questioned and contextualized by scholars from different disciplines.[14] Additionally, the entangled human-planetary relationship, popularized through concepts such as the Anthropocene, has brought conversations about time and temporality into the growing interdisciplinary field of environmental humanities.[15]

The "change" in climate change relies on implicit temporal knowledge: from when has something changed? At what pace are we experiencing these changes? What are the futures, pasts, and presents that are being taken into consideration? Without an understanding of past climates, contextualizing change and imagining climatic futures becomes an impossible task.[16] Considering the many variables operating on different timescales involved in the making of the 2°C target, temporality has always been present throughout the target's existence, although in a somewhat hidden capacity, obscured by the linearity of the record. Behind the singular timeline of the 2°C target hide many layers of time.

The ways through which climatic changes on different scales have been known concern a multitude of methodologies, geographies, and practitioners that gradually merged into the timeline of the 2°C target. The data which underpin climate graphs are products of scientific practice and material technologies—both through temperature measurements in real time as well as the production and establishment of proxy records such as ice cores, deep sea cores, tree rings, and pollen analysis of lake sediments. In this context, the 2°C target appears as a fundamentally temporal concept, binding many different times into a one-digit political temperature target. The many different records—both in terms of temperature measurements and in the sense of abnormal climatic events—have to be reconciled and synchronized in order for the 2°C target to function.

By placing temporality at the center of analysis, the multiplicity of times embedded in the 2°C temperature target, and the increasingly complicated relationship between human historical time and the timescales of planetary dynamics, becomes visible. The German historian Reinhart Koselleck—who already in the 1970s questioned the quasi-natural position of a linear and unified order of historical experience and instead invoked the notion of multiple times existing simultaneously[17]—made the distinction between "historical" and "metahistorical." According to Koselleck, the historical is what is normally perceived as human history and the metahistorical is the natural conditions beyond the impact of human activity. However, the boundary between the two is not predetermined, but is in itself the outcome of historical processes, and the way the separation between historical and metahistorical is produced can be studied as contextually dependent phenomena.[18] In contrast to the Braudelian tripartite of historical time, Koselleck's concepts of metahistorical and historical allow for some fluidity between the categories. He writes: "Theoretically this would entail asking where the metahistorical pregivens of the human *Lebensraum* shift or are transformed into historical pregivens that humans can influence, master, or exploit . . . Seen in this light, the relational scale between space and history shifts depending on whether spatial pregivens are conceived of as metahistorical or historical."[19]

The emergence of political temperature targets, and global average temperature as an object of governance, highlights the contingency of Koselleck's boundaries. Seeing the annual global climate record and the 2°C target as not solely a coproduction of science and politics, but also as the outcome of temporal work, involving means of negotiating, representing, measuring, and knowing changes over time, open up new questions regarding the historicity of climate discourse. In the history of attempts to unify a multiplicity of temperature records into a one-digit political temperature target, temporality played a hidden yet important role.

The Evolution of the Instrumental Temperature Record

The most significant contemporary manifestation of the policy-science interface in regard to international efforts to set limits on global mean temperature is the 2018 Special Report on Global Warming of 1.5°C produced by the Intergovernmental Panel on Climate Change (IPCC) at the behest of UNFCCC following the 2015 Paris Agreement.[20] Following the fifth IPCC assessment report (AR5) from 2013–14, the Special Report provides a useful example of how the premier international institution for climate science has engaged with temporality in terms of the somewhat vague political imperative, as stated in Article 2 of the Paris Agreement, of "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels."[21]

The multiple temporalities—and questionable start date for the industrial era—embedded in global climate policy-science are apparent in the working definition of warming the Special Report applies: "warming at a given point in time is defined as the global average of combined land surface air and sea surface temperatures for a thirty-year period centred on that time, expressed relative to the reference period 1850–1900."[22] Like in AR5, the 1850–1900 timespan is employed as an "approximation" or "proxy" for preindustrial conditions when humans had marginal impact on the climate system. Rather than proposing that the year 1850 represented a turning point in industrial activity or anthropogenic carbon emissions, the choice of reference period is in fact more closely related to nonhuman natural factors and the availability of reliable temperature data—which were sparse before the middle of the nineteenth century[23]—collected at locations across most areas of the planet. As stated in the IPCC Special Report, the reference period entails "a compromise between data coverage and representativeness of typical pre-industrial solar and volcanic forcing conditions."[24]

Labeling 1850–1900 as "preindustrial" proved politically controversial among government delegations at the AR5 plenary approval session, and the association of that timespan with the term was subsequently deleted from the draft. Similar to Jones and Briffa's designation of 1850 and onward as the "instrumental period" from when the availability of temperature data recorded across large spatial scales enabled near global averaging, some countries present at the AR5 plenary favored calling 1850–1900 the "early instrumental period," an idea echoed in the 2018 Special Report, which labels the timespan starting in 1850 as "the period of instrumental observations."[25] Preindustrial was however used elsewhere—often inconsistently—in AR5, with, for example, 1750 being mentioned as the threshold for significant anthropogenic interference in the climate system.[26] Despite this, the Special Report applies the same 1850–1900 baseline as AR5, which Hawkins et al. note was a pragmatic yet suboptimal selection.[27] "Ideally, a preindustrial period should represent the mean climate state just before human activities demonstrably started to change the climate through combustion of fossil fuels," which, the authors explain, were already well underway by 1850.[28] They argue instead for 1720–1800 as a more suitable surrogate for preindustrial conditions, due to the relative lack of anthropogenic forcing, and similarities to the current period in terms of natural forcings.[29]

The working definition of industrial-era warming employed in the 2018 IPCC Special Report is an average of three institutionalized datasets that calculate warming since the latter half of the nineteenth century.[30] The data series of HadCRUT—a collaborative effort of the University of East Anglia and the Hadley Centre at the UK Met Office—starts in 1850, while 1880 is the point of departure for both GISTEMP at NASAs Goddard Center for Space Studies and NOAAGlobalTemp at the National Centers for Environmental Information (NCEI) within the US National Oceanic and Atmospheric Administration. Employing historic instrumental readings, these three temperature analysis systems reconstruct past climates and track long-term changes in global mean surface temperature (GMST) on a monthly basis. Given their central position within IPCC-UNFCCC deliberations, and as the empirical bases for media framings of current temperatures as historical aberrations, HadCRUT, GISTEMP, and NOAAGlobalTemp together constitute the de facto record of global warming for science, society, and politics.

Although the instrumental data they draw upon date back to as early as the middle of the nineteenth century, the three guardians of the instrumental temperature record did not emerge until the 1980s, demonstrating the relatively recent development of an ongoing, institutionalized timeseries of warming that could serve as an anchor point for the science-policy discussions on climate change that gained traction during that decade. GISTEMP resulted from the work of James Hansen and colleagues, whose initial calculations of changes in global mean temperature from 1880–1980 were published in a 1981 article in *Science*.[31] The data selection efforts that eventually led to HadCRUT were initiated in the late 1970s at Climate Research Unit—founded by climate historian Hubert Lamb in 1971 at UEA—and by 1986 came to include temperature data from marine environments in addition to the land-based measurements that earlier GMST estimates were based upon.[32] By the end of the 1980s, the increasing interest in climate change prompted the National Climatic Data Center (which was merged into NCEI in 2015) to launch its own analysis of historic temperature data, leading to the NOAAGlobalTemp time series.[33]

Efforts to estimate changes in global average temperature over time predate the advent of today's institutionalized datasets by about a century, facilitated by the invention and increased availability of thermometers, and major leaps in the collection and standardization of meteorological data by scientists and governments (primarily in eastern North America and Western Europe) in the latter half of the nineteenth century—a process further abetted by the founding of the International Meteorological Organization (IMO) in 1873.[34] In the 1870s to 1880s, the Russian-German climatologist Wladimir Köppen, for example, drew on data from over one hundred land-based monitoring stations in the tropics and temperature zones to construct a near-global time series of average annual temperatures from 1841–75 in order to assess whether temperature changes could be connected to sunspot cycles.[35] Despite the advances taking place at that time, access, quality control, homogenization, and spatial gaps in data still represented formidable challenges, which Köppen was the first scientist to adequately overcome.[36]

The establishment of the World Weather Records (WWR) on the initiative of the IMO and first published by the Smithsonian Institution in 1923 provided an immense source of meteorological data from hundreds of stations around the world, with some records reaching back to the early 1800s. This data trove enabled Guy Stewart Callendar, who was intent on proving the carbon dioxide theory of climate change, to create a global average temperature timeseries spanning 1880–1934, and demonstrate for the first time that global temperatures were in fact rising—by approximately 0.3–0.4°C.[37] Initially examining readings from some two hundred locations, Callendar carefully selected WWR data from 147 land-based stations situated between 60° North and 60° South, with the polar regions being excluded due to the sparsity of Arctic observations (only two stations) and nonexistence of Antarctic data (not monitored regularly until the 1950s).[38] Representative of the multiple temporalities embedded in climate discourse, the notion of anomaly, or departure from a longer-term mean, was a key element of Callendar's and subsequent attempts to estimate and contextualize warming. For example, the fifty-five-year record that Callendar constructed also included departures, expressed as a ten-year moving average, from the mean surface temperature of a thirty-year (1901–30) reference period.[39]

Hurd Willett, a meteorologist at M.I.T., developed the next significant timeseries of global average temperature, which was published in 1950.[40] Drawing on updated WWR data extending to 1940, and employing different averaging methods and station selection criteria than Callendar, Willett selected 129 stations to represent a global temperature record reaching back to 1845, and used a five-year period (1935–39) from which to measure for anomalies.[41] Willett's work was subsequently influential on both Callendar, who in

1961 updated his near-global timeseries based on data from 450 stations, and Murray Mitchell Jr. from the Office of Climatology at the US Weather Bureau, who had previously studied under Willett.[42] At a meeting of meteorologists in New York in January 1961, Mitchell presented his findings from a timeseries of global temperature based on data from some two hundred stations dating back to 1882, which demonstrated that temperatures had been rising until 1940, at which time they began to fall.[43]

The Political Trajectory of the 2 °C Temperature Target

These pioneering efforts of Callendar, Willett, and Mitchell were important scientific interventions in terms of conceptualizing and estimating global average temperature at a time when climate change was yet to become an issue of great public and political concern. Although their work predated the advent of what we call political temperature, it represented an essential step in the process of rendering the earth a governable object through policies connected to quantified data. The institutionalization of GMST in the 1980s, starting with the establishment of GISTEMP, provided advocates of international political action on climate change a continuous (updated monthly and annually) temperature record and benchmark upon which policies could be based and evaluated over time.[44] By the mid-1990s, with the European Union's decision to aim for limiting global temperature to 2°C above preindustrial levels, the target had begun its ascent as a central object of international climate policy, eventually enshrined in the 2015 Paris Agreement.[45] The prehistory of the political target can however be traced back exactly a century before the EU adoption of 2°C in 1996, to the calculations of the Swedish atmospheric chemist Svante Arrhenius attempting to estimate the impact on global temperature from a doubling of carbon dioxide concentrations in the atmosphere.

Without explicitly elaborating the advent or institutionalization of GMST as such, Samuel Randalls notes that policy measures to govern climate change, whether based on temperature limits or carbon dioxide concentrations, would have been impossible without the quantitative analysis of the climate system pioneered by scientists such as Stockholm University's Svante Arrhenius towards the end of the nineteenth century.[46] Climate sensitivity—expressed as the increase in global temperature resulting from a doubling of CO_2—was a key concept for Arrhenius, and continued to be for his successors in the second half of the twentieth century.[47] While Arrhenius—who saw the prospect of global warming as largely benign—initially estimated in 1896 that doubling CO_2 would lead to 5–6°C warming (reducing his estimate in 1906 to 4°C), some later scientists calculated climate sensitivity to be in the range of 2–3°C.[48] Demonstrating the ongoing uncertainty surrounding climate sensitivity, and the contemporary relevance of Arrhenius's calculations, the most recent fifth IPCC assessment report estimates climate sensitivity to be between 1.5–4.5°C, the same range as the influential Charney Report of 1979.[49]

These scientific efforts to establish the relationship between CO_2 concentrations and global temperature can be seen as precursors to the political target of 2°C.[50] The two components of climate sensitivity provided the economist William Nordhaus, whom Jaeger and Jaeger credit with first proposing the 2°C limit as a basis for climate policy, with the quantitative indicators to perform cost-benefit analyses for climate change starting in the mid-1970s.[51] Drawing on contemporary science, Nordhaus associated 2°C with a doubling of CO_2 and as representing an upper limit of the "normal range of long-term climatic variation," i.e., a maximum global temperature recorded over the past 100,000 years as compared with a 1880–84 mean temperature.[52] Randalls contends that Nordhaus, similar to scientists who earlier applied CO_2 and global temperature in their modeling of climate sensitivity, employed these concepts as heuristics in his economic models of climate change, rather than proposing 2°C as a normative basis for climate policy.[53] Jaeger and Jaeger, acknowledging that Nordhaus's "intuition" did not influence policy at the time, imply that his introduction of 2°C into the climate debate had a latent yet decisive effect on later science-policy discussions.[54]

Science-based policy proposals employing temperature targets became more explicit in the late-1980s. Following a landmark conference in Villach, Austria in 1985, where scientists concluded that climate change warranted international political action, workshops in 1987 in Villach and Bellagio set out to produce potential options for policymakers.[55] One result of the 1987 workshops was a report published in 1990 by the Stockholm Environment Institute (SEI) under the auspices of the Advisory Group on Greenhouse Gases (AGGG)—a blue ribbon scientific panel established after the 1985 Villach Conference and considered the forerunner of the IPCC.[56] One section of the SEI/AGGG report put forward 2°C as a potential—albeit high-risk—benchmark to guide international climate policy, which was in the process of becoming institutionalized in the lead-up to the Rio Earth Summit and the establishment of the UNFCCC in 1992.[57] Following the SEI/AGGG publication, another key intervention in establishing 2°C as a political temperature target was a 1991 editorial in the specialist journal *Climatic Change* by Vellinga and Swart—coauthors of sections of the aforementioned report—that framed 2°C in explicitly normative terms.[58]

The most apparent line of transmission for 2°C between the realms of science and policy can be seen in the efforts of the German Advisory Council on Global Change (WBGU) and one of its leading members, the politically influential physicist Hans-Joachim Schellnhuber, who has served as science advisor to Angela Merkel from her time as Germany's environment minister starting in 1994.[59] For the first UNFCCC Conference of the Parties, held in Berlin in 1995, WBGU submitted a statement that evoked a "tolerable 'temperature window' . . . derived from the range of fluctuation for the earth's mean temperature in the late Quarternary [*sic*] period," corresponding to a circa 2°C temperature increase above preindustrial levels.[60] Claiming responsibility for initiating the political process—partly through his proximity to Merkel—that led to the adoption of 2°C by the European Union (in 1996) and UNFCCC (in the 2009 Copenhagen Accord), Schellnhuber acknowledges that the target represents a politically expedient benchmark rather than a scientifically-calculated critical limit, based on the idea that humans have never existed in a world warmer than 2°C above preindustrial levels.[61]

Proxy Records and the Compression of Time

Ever since the 2°C target first emerged as a political concept, multiple measurements of temporal change have been invoked in order to establish its legitimacy.[62] In William Nordhaus's 1977 article "Strategies for the Control of Carbon Dioxide" an early visualization of the temperature trajectory of the planet comprises two different timescales, 100,000 years and the twentieth century, in the same diagram.[63] Nordhaus admitted that his estimations, particularly concerning the long-term dynamic of the planet's climate, were not based on any solid data, but should rather be considered "rough guesses."[64] As the 2°C target gradually became institutionalized as a frame of reference and a political global target, new scientific data were added to the conceptual framework.

Additional dating methods were drawn into the making of climate graphs in order to establish rates of change of the climate system over timespans that far surpassed that of the global average temperature estimates that, following the proliferation of thermometers and the early efforts of scientists to process copious amounts of instrumental data, had existed since the mid-nineteenth century. Climate proxies, such as corals, deep sea cores, lake sediment samples, tree rings, and ice cores have all been utilized in different contexts to track climatic changes over vast periods of time.[65] Proxies for past climates can even encompass documentary evidence; one example is the written records of the varying dates of grape harvests in France since early modern times that Emmanuel Le Roy Ladurie drew upon in his pioneering work in the field of historical climatology.[66] By invoking longer, much deeper temporal frameworks, the proxy records became crucial technologies in distinguishing the scales against which humanity's impact is measured. The increasingly textured records of the deep past, together with the expansion of human impact on planetary dynamics, brought events in deep time into politics and

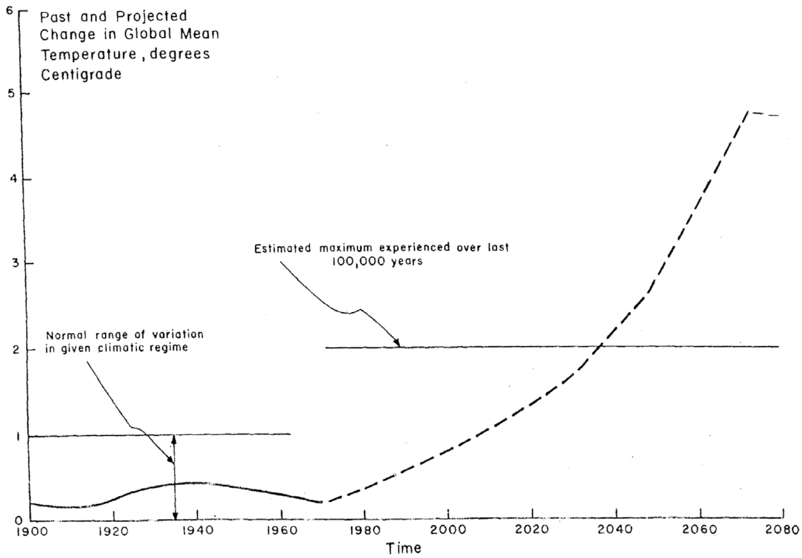

Figure 1. Past and projected global mean temperature, relative to 1880-84 mean. Solid curve up to 1970 is actual temperature. Broken curve from 1970 on is projection using 1970 actual as a base and adding the estimated increase due to uncontrolled buildup of atmospheric carbon dioxide.

Figure 10.1 An early suggestion of 2°C as a governance target. Figure by William Nordhaus, 1977. Used with permission from William Nordhaus and the Cowles Foundation.

economic considerations.[67] In Koselleck's terms, the proxy records ventured from the metahistorical to the historical when they became immersed in the making and establishing of political temperature targets and issues of environmental governance.

Proxy records emerged from several different disciplines, such as oceanography, glaciology, atmospheric sciences, and geology, bringing in both a multiplicity of temporal frameworks as well as a multiplicity of geographies.[68] With the formation of Earth System Science in the 1980s, the conception of a planetary system which could be regulated through scientific practice and environmental governance gave further importance to proxy records, as they provided a frame of reference for long-term changes on a planetary scale.[69] Separate ways of measuring planetary change became increasingly integrated during the 1980s following efforts to synchronize the "archives" which were available to the earth system scientists at the time.[70]

Despite the seemingly unequivocally layered and prearranged manner in which time appears in material climate records, it was not self-evident how the many different times stored in trees, ocean floors, corals, ice, and lake sediments could be made to fit within the framework of political temperature targets. Rather, this work of synchronization unfolded as a historical process in itself, and the calibration of various proxy records was the subject of negotiation among scientists from different fields. The process of translating material proxy records into datasets, to be utilized in large-scale climate modeling, rendered possible aggregated timescales beyond disciplinary boundaries. There were also concerns raised, for example among palynologists, that the planetary scope of the timescales would obscure regional varieties and locally situated ecological processes.[71]

This concern was not as prominent among ice core scientists and ice cores have increasingly emerged as perhaps the most iconic and well-known proxy record to date.[72] The vast records of climatic changes made visible through ice cores were less sensitive to local variance and fit well with the planetary scope of Earth System Science. Ice cores can also serve as an emblematic example of how deep time has been invoked, represented, and synchronized into a framework of political temperature. During the 1970s and 1980s, several ice core scientists were instrumental in bringing ice core timescales into the climate modeling community and ice core data were increasingly picked up in scientific communities beyond glaciology.[73] Their long, vertical shape, with clearly distinguishable layers of past atmospheric conditions stored in the ice, made them adhere to a familiar stratigraphic way of arranging time.

Kathryn Yusoff locates one of the most appealing characteristics of ice cores in the way they speak to already existing Western notions of temporality by making history appear in a linear fashion ordered through clearly separated layers.[74] When they enter human history, as is the case when ice cores are used as proxies in establishing human impact and projecting planetary futures, their status as objective messengers from the deep past ventures into other spheres of engagement and concern. They are in this sense not only recording devices used by humans to measure the earth, but devices that are recording humanity itself, and how the latter is affecting the planet.[75] The temporal boundaries of political temperature can thereby be expanded through the ice core data and add an additional layer to the already existing notion of measuring and governing anthropogenic impact on the global temperature levels.

With the particular case of the 2°C target, proxy records have been gradually drawn into the political temperature framework. One emblematic example of such a process dates back to 1987, when new data made possible through ice core drilling at the Soviet Vostok Station in Antarctica provided greatly enhanced records of past climates. Temperature data gathered through ice core drilling had first appeared in the postwar years, and it gained greater temporal scope and accuracy in the 1960s, predating the notion of a political temperature target.[76] The timescales made visible in the early ice cores were not automatically perceived as being connected to the timescales of environmental policy. From early ice core drilling in the 1960s to the integration of the Vostok ice core into notions of 2°C in 1987, different ways of measuring, representing and experiencing time had moved closer to one another.[77] The long and detailed records from the Antarctic ice sheet could enter an already existing conceptual and temporal framework that preceded its recovery. The first Vostok ice core recovered in 1987, in Spencer Weart's words, "tipped the balance in the greenhouse-effect controversy, nailing down an emerging scientific consensus."[78]

Even though Nordhaus, in his 1977 model, had used his own intuition as the main reason for setting a 2°C target, the data from the ice core aligned with the initial hypothesis and confirmed that the past 100,000 years had not seen global mean temperature reaching much higher than 2°C above the preindustrial average. An additional temporal layer, that of the deep past contained in the Vostok ice core, could be added to the already existing visualizations of climate change, bridging and combining ice core data, global average temperature measurements, and political temperature targets into one unified timeline.

Conclusion

The invocation of records is a widespread discursive practice for contextualizing and benchmarking social and environmental phenomena that can be variously characterized as normal, abnormal, average, anomalous, outstanding, or exceptional, as well as indicators of trends and trajectories pointing towards alternatively bright or frightening futures. In the case of climate elaborated in this chapter, we have demonstrated that the temperature record—often alluded to yet seldom specified in terms of its temporal, material, or methodological underpinnings—is essentially a synthesis of some two centuries worth of curated instrumental measurements averaged globally, and various natural climate archives accumulated over millennia that have in recent years been retrieved, interpreted, and integrated into the expanding corpus of climate knowledge by specialists from a range of scientific disciplines.

While the three primary institutions that today calculate global mean surface temperature constitute the de facto guardians of the instrumental record, the *longue durée* temperature timeline also incorporates the array of proxies, that serve to, in Koselleck's terms, synchronize the historical and metahistorical and effectively transport the deep past into the policy present. This temporal work has resulted in a far more comprehensive and convincing record of a changing climate—a record *of* record, so to speak—that has underpinned efforts to govern the global climate on the basis of a single temperature target established at the interface of science and politics.

Rendering temperature governable, or, in other words, creating *political temperature*, was, we argue, more than a process of coproduction of science and politics. It was fundamentally a process concerned with temporality, and with ways of measuring, recording, and representing a multiplicity of temperature records in order to fit them into preexisting governance frameworks. By drawing attention to the way scientists have taken part in producing climate pasts, presents, and futures, the history of temperature records and political temperature targets can be understood as a history of mediating between multiple ways of sensing and knowing time. As new objects enter the domain of governance due to human planetary impact, with global average temperature being one example, the process of temporalizing these phenomena moves to the forefront of political discourse. Yet, implicit assumptions of how to represent and record temporality are often held in a quasi-natural position, as is the case of the ambiguous notion of "the record." Behind this seemingly unified timeline lies decades of scientific and temporal work, which despite its hidden role, has been instrumental in defining the climates of the past, as well of those to come.

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