

The dual role of climatology in (German) colonialism

Hans von Storch

Institute of Coastal Research, Helmholtz Center Geesthacht, Germany

hvonstorch@web.de

and

Carsten Gräbel

Institute of Geography, University of Hamburg, Germany

carsten_graebel@hotmail.com

ABSTRACT

Climatology played an important dual role for European colonialism in the 19th century.

One aspect was the documentation of the climatic conditions, which colonialists would meet overseas, and the related challenges. Thus, collecting meteorological data was an important task in preparing and managing colonies – a mostly technical-meteorological task.

In addition, climatology shaped and influenced politics and ideology during the colonial period. According to the doctrine of climatic determinism, the emergence of “civilizations” depended on favorable climatic conditions. A favorable climate was marked by considerably day-to-day variations and by moderate annual variations. Generally, these favorable regions were located in the mid-latitudes of the globe, particularly in Northwestern and Central Europe and in a belt crossing the North American continent. From this alleged natural superiority followed – in the thinking of the time – the moral legitimization to exploit the less favored regions and to enforce western ideas about economy, statehood, religion, education, and science.

Prologue

We are approaching the issue of modern colonialism (say, since 1800) from the viewpoint of the science of climatology. Therefore, we are mainly interested in the role, climate knowledge played in the western colonial policies. Thus, our approach differs from that of most historians. Indeed, the first author is a climate scientist with almost 50 years of experience in the field, which has developed from a sleepy bookkeeping exercise in the 1960s to a major actor in the global political arena.

We are not able to add significant historical results. Indeed, Mahoney & Endfield (2018) offer an excellent overview of the state of knowledge and analysis. Instead, we offer hypotheses and observations on the nexus of colonialism and climate science. Our analysis is based on material mostly related to the **German practice**; indeed much of the literature and material from the 19th and early 20th century is not in English, but also in German, French, Japanese etc., while the current scientific analysis seems mostly rooted in English-language material (Mahoney & Endfield, 2018).

Climate Science

The concept of climate has undergone significant changes in the past 100 years, in particular the relationship between regional and global climate. Since about the 1970s, climate is conceptualized as a global object, which is determined chiefly by the amount of solar radiation arriving at Earth, the rotation of the Earth, and the radiative properties of the atmosphere and of the Earth surface. Regional climate are in this concept the regional manifestations of the global climate, which in principle may be considered the results of “downscaling”. Thus, regional climates are interesting chiefly because of the impacts of climate on georisks, ecosystems, economy and health. The regional manifestation is a key aspect in dealing with adaptation to man-made climate change, while most of the political debate focusses on the mitigation of global climate change (global warming, tropical storms, sea ice, sea level).

At the time, when modern colonialism was a main driver of mostly European powers, climatology served other purposes. In those days, the global climate was determined by studying the climate in all regions of the world, mostly by drawing maps. These regional maps were assembled into global maps, as for instance done by V. Köppen and others. The main center of climatology at the turn of the 19/20th century was in Vienna at the “Central Institute for Meteorology and Geodynamics” (Zentralanstalt für Meteorologie und Geodynamik), under the leadership of Julius Hann (Hammerl, 2018). In general, climatology was needed for agriculture but also for transport and trade.

A major application of climatology was planning for colonial acquisitions, and for shipping routes for connecting colonies with homelands. More on this later.

Mostly independent of the bookkeeping of regional climatologies all over the world, climatology was engaged in constructing a superiority of western people and an inferiority of non-western people. This is the field of climate determinism. More on this, also later.

Climate Management

An obvious task was the determination of the climate of prospective and of acquired colonies. Knowledge about climatic conditions contributed to decision processes about setting up colonies, and about how to colonize.

This interest is consistent with the goal of describing the global state of the atmosphere. In the *International Meteorological Codex* (Internationaler Meteorologischer Kodex) of 1911, Gustav Hellmann wrote, „Each civilized state (Kulturstaat), which runs a meteorological service and possesses colonies, should make sure that also in its colonies and dependencies meteorological observations are regularly made and published according to the internationally agreed principles.” This system of rules and procedures allowed for international cooperation and the exchange of data across national borders and different scientific traditions. The Codex listed the decisions of the previous international conferences of the Meteorological Committee. Among these decisions, taken in Rome 1879, was the request for observations in the “hot zone”; later, in 1891 this request was extended to the Pacific Ocean. A great practical and scientific use of such data was emphasized, and it is plausible that the interest was also related to ongoing colonialism in that region. Later, in 1905, Germany was asked to intensify its monitoring activities in its newly created colonies of Samoa, the Bismarck Archipelago and the Caroline Islands (part of German New Guinea).

Climate and European Settlement

The question if colonial regions would be suitable for permanent settlement of Europeans was a key aspect of the colonial debate in Europe.

An example is related to the British colonization of Papua-New Guinea (Eves, 2005). New Guinea was considered a “grave for the white man”, with paradisiac landscapes but for Europeans murderous health conditions. As a result, colonial settlement of Europeans was assessed as impossible apart of higher-altitude locations. Thus, the British Empire had to turn to colonial exploitation, using labor by locals or by other people from the tropical world.

The German Josef Marner (1940) analyzed the needed conditions for European settlers for East Africa. He identified as detrimental factors strong solar radiation, permanently high air temperatures coupled to high humidity, small annual variations, and the “Wetterlosigkeit” (absence of weather) because of little non-seasonal variations. From the climatic conditions of all 12 landscapes types of the former German colonies, he derived their suitability for colonial settlements. Suitable regions, he determined, were various highlands in East Africa.

Still in 1938, at the International Congress of Geography in Amsterdam (Union Géographique internationale: Comptes Rendus du Congrès international de Géographie Amsterdam 1938. Leiden: E.J. Brill 1938) the issue of acclimatization to tropical climate was discussed broadly. Almost all contributions of the section on “colonial geography” dealt with this topic – with a focus on barriers for European (“white race”) settlement.

Monitoring Climate

In China, mostly foreigners began continuous modern meteorological observations (Fei, 2019): “Russian Orthodox missionaries [began] continuous meteorological observation in Beijing [in] 1841. That of Shanghai ... in 1872 at Xujiahui (also known as Zikawei. 徐家匯) by Catholic missionaries. That of Hong Kong ... in 1884 by the British Colonial Government. In Taiwan, several meteorological observatories were established in 1885 by the government

of Qing Dynasty. That of Qingdao (Tsingtau) ... in 1898 by the German Concession Municipality.”

In Germany, the imperial authority “Deutsche Seewarte” in Hamburg played a significant role in collecting overseas weather data. Academically, the Seewarte cooperated with Hamburg University and its precursor, the “Colonial Institute” in Hamburg (von Storch et al., 2019).

In the first few years of German colonial rule, the Seewarte began to establish and furnish meteorological stations near the coast. Over time, the institution became the central body within the meteorological service in the German colonies. In 1899, Hans Maurer, a trained meteorologist from the University of Strasbourg, returned to Germany after four years of serving as government meteorologist in German East Africa. In Hamburg he started a career at the Seewarte and soon became Georg von Neumayer’s personal assistant. His main tasks was the analysis of meteorological data he had helped to gather during his residence in Africa. In 1904, he moved to the Imperial Naval Office, but Paul Heidke, another young meteorologist, carried on his work. In 1914, the German colonial office agreed to extend and professionalize the colonial meteorological service. The Seewarte was supposed to run a department for colonial meteorological services. The position of government meteorologist had existed in East Africa and only recently in Cameroon, but was going to be introduced in other colonies. However, the outbreak of World War I shattered all plans. Meteorologists began to attune to colonial revisionism and propaganda. Paul Heidke, for example, lamented “the theft of our colonies” (Raub unserer Kolonien) and glorified the meteorological observation network as a great cultural achievement and an example of the greatness of German colonization. (Heidke, 1921, pp. 101-103)

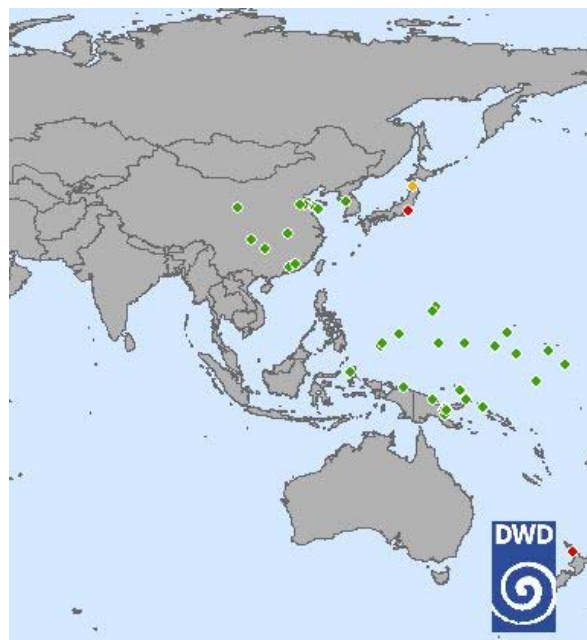


Figure 1: Locations of the overseas stations of the Deutsche Seewarte Hamburg (1830-1943).

Data of stations marked in green have already digitally archived.

https://www.dwd.de/EN/ourservices/overseas_stations/ueberseestationen.html

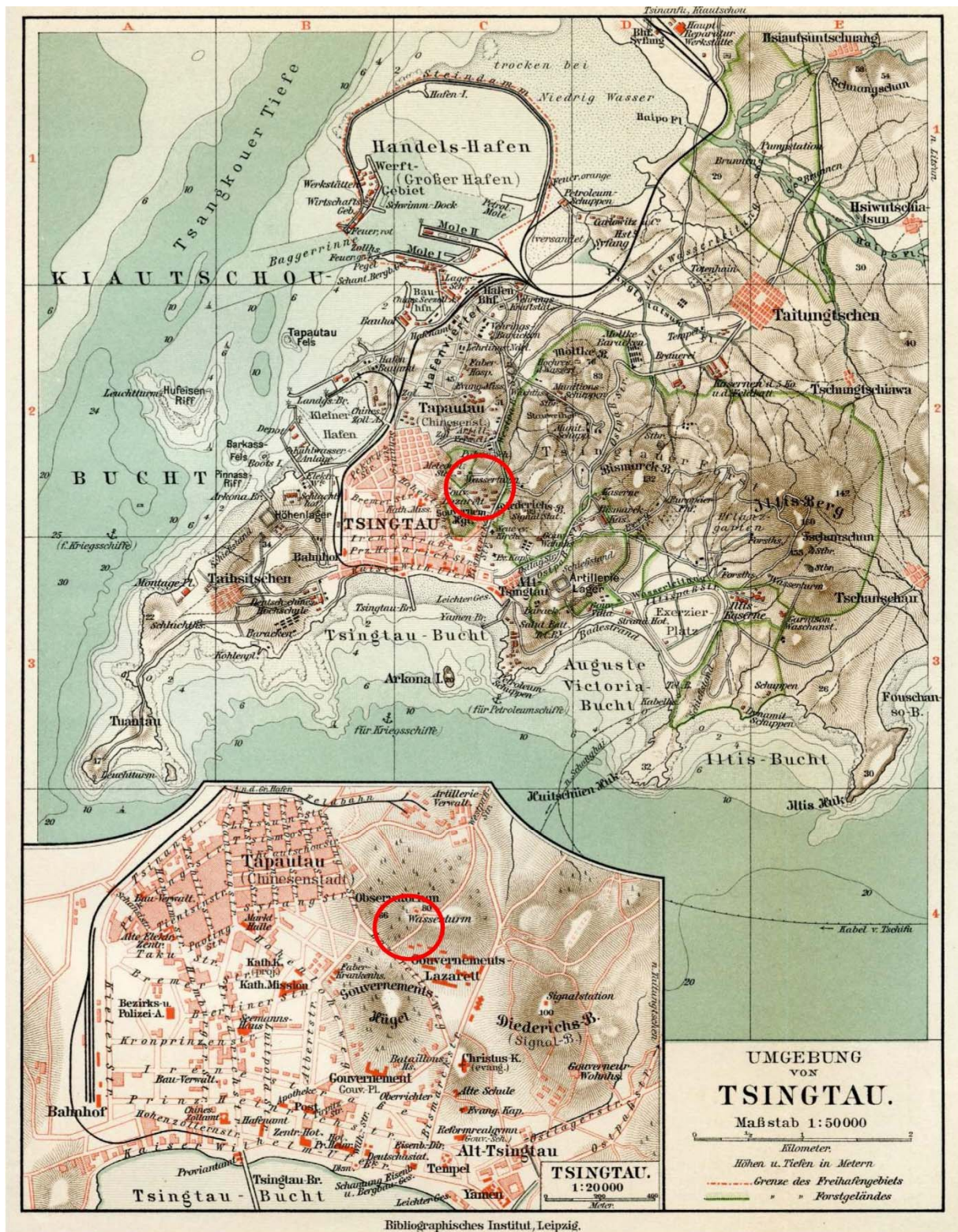


Figure 2: Map of the Tsingtau. From Meyer (1910, Appendix)

The case of Qingdao

In the early 20th century, Germany possessed a few colonies in Asia and the Western Pacific, namely Kiautschou, German Samoa and German New Guinea. A number of meteorological stations were run in the region (Figure 1), some in the colonies, and some outside of the colonies (mainly China and Japan).

In the following, we will address the practice and the data from **Kiautschou**. Legally speaking, it was not a colony but a “protectorate”, which after a military occupation on 14. November 1897 was leased in 1998 from China through a 99-year treaty (Kortum, 2004, and more references given therein). The purpose of this German outpost was securing German trade interests in the Far East. This area was administered by the German navy. The main settlement in the colony was **Tsingtau** (Figure 2) - in modern writing Qingdao or 青島.

The meteorological service collected temperature, precipitation and air pressure data, plus a number of non-meteorological data, among them tides and currents (cf. Mohr, 1911; Shen et al., 2016). The continuous observations began on 1. January 1890. In 1904, a new observatory was set up, and in 1905 a telegraphic line to the observatory Zikawei [see above] established. Director was Bruno Meyermann, who likely was the author of these lines about the purposes of the observatory: “These were three-fold: providing standard time for warships, providing storm warnings, and determining local variations in the earth's magnetic field to correct naval compasses. The statement proposed a staff including a director, one assistant, one helmsman, one junior officer, one scribe and three Chinese servants. “

Meyermann had ambitious plans: „The Tsingtao observatory should not only provide a meteorological service for the conditions in the Dependency and its hinterland but become an autonomous, efficient weather and storm-warning service for all of China. Besides the observatory in the Dependency, there were nine additional stations, namely Tsimo, Kiautschau, Weihsien, Tschu-tscheng, Tsinanfu, Taiyuanfu, Peking, Kaifongfu, and Schangscha. The observatory received monthly reports of meteorological conditions from all of China by the Chinese customs service and from stations in China’s west. Also, a close cooperation with the already mentioned Zikawei was built in matters of weather prediction: “Twice daily he sent meteorological telegrams to the Jesuits, and he set up an auxiliary station at the University of Taiyuan in Shansi province.“ (Pyenson, 1985). The German Weather Service provides a list of stations, which however differs from Pyenson-list (see Figures 1, 2).

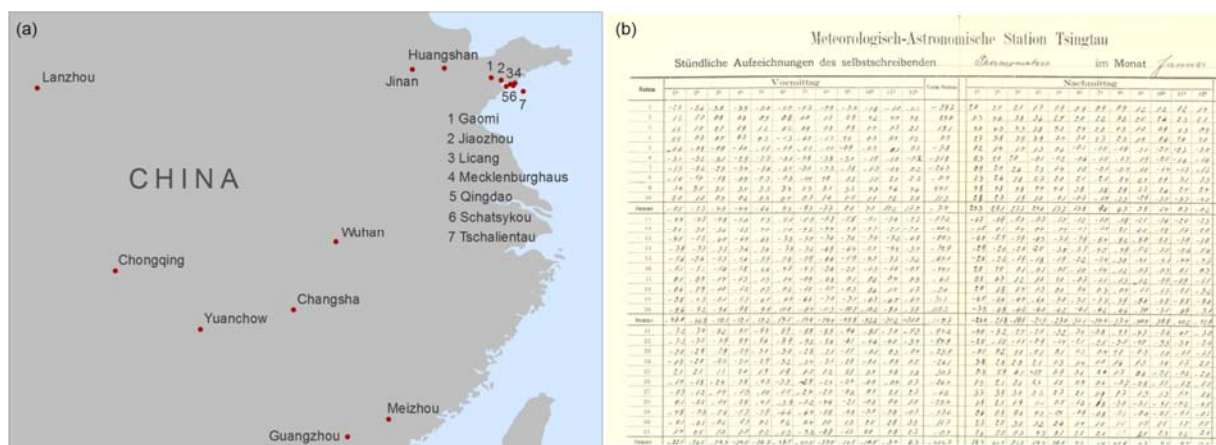


Figure 3: Left: Positions of the 14 stations of the German Marine Observatory in China. Right: Handwritten records of Qingdao from the archive of the German Meteorological Service in Hamburg --- from Li et al. (2018)

According to Meyermann observations were done by **German personal**. However, a common colonial practice seems to have been to attribute little credit to local coworkers, for

emphasizing the purported cultural superiority of Europeans. However, Meyermann worked in his observatory with several Chinese coworkers, among them two assistants and two computers (Mühlhahn, 1998). It was also planned to train Chinese observers at the German-Chinese college, who were supposed to work in a future Chinese observational network. These details lead to an interesting question, which may deserve more research, namely the degree of cooperation between the German colonial services and fledging national (Chinese) services (c.f., Fei, 2018).

The **data recorded in Qingdao** during the colonial time (Figure 3) survived the war-torn times of world wars I and II, and were eventually secured in Hamburg in a bunker. In 2013 they were digitized by the German Weather Service in Hamburg in the project “*Digitalization of historical climate data from Chinese stations*” (Deutscher Wetterdienst, 2008; see also Appendix), and in 2008 given to the Municipal Weather Service of the city of Qingdao. In 2014, upon the request of Qingdao, also the original documents were handed over (see Figure 4). Since then, the data have been used to construct extended homogeneous time series of weather variables in Qingdao (Li et al., 2018). The data are publicly available through https://www.dwd.de/EN/ourservices/overseas_stations/ueberseedoku/doi_qingdao.html.



Figure 4: The handover ceremony of the historical data from German colonial times to the Municipal Weather Service of Qingdao on 8 April 2014. At the podium: The head of the Hamburg office of the Deutscher Wetterdienst, Gudrun Rosenhagen.

Colonial Legitimization

In 1910, Fritz Jaeger was the first geographer, who was bestowed a chair of “colonial geography” in Germany. He argued that the physical properties of the landscape and of the people would be related to climate (Jaeger, 1911). Using the standard stereotype of a warm-wet climate, which would reduce the amount of work needed for a living, he claimed that in such countries people would have remained on a lower level of culture. Very different would be “raw” climate of mid latitudes, which would force people to hard work and higher culture.

Thus, it is climate, which causes the difference between tropical people and Europeans – so that the colonization was legitimate because of the cultural superiority of the Europeans. Of course, this line of reasoning is fully consistent with the old and powerful narrative of climatic determinism (Stehr and von Storch, 2000):

“Climatic determinism is the understanding that knowledge about the state of the climate, be it stationary or changing, provides significant insight about socially relevant processes, such as economic efficiency, physical energy and health of people or social and civilizational aspects and achievements. In the classical climatic determinism, the success of certain people in attaining “high levels of civilization” was attributed mostly to climate“ (Stehr and von Storch, 1999, and references therein).

Stehr and von Storch (1999; appendix) prepared an inventory of the purported impacts of climate – they range from alcoholism, crime, cleanliness, mortality, life expectancy, fertility, temperament, and stupidity to work attitudes, to mention some.

The most known and maybe most “modern” representative of climatic determinism was Ellsworth Huntington (for a biography see Martin, 1973). Huntington (1945, p. 275) drew the significant conclusion: “Thus, if all other influences were eliminated, we should expect civilization to advance most rapidly in climates which have few or no months with temperatures above the optimum and many below, but none too far below the optimum. As a matter of fact, the actual distribution of civilization approaches this pattern but departs from it in some respect because mean temperature is only one of the climatic factors of environment, and the effects of physical environment are modified by cultural environment.”

This purported coincidence of “climatic energy” and “level of civilization” was based on two global maps, which shared some similarities (Figure 5). Thus, it was claimed, that there was a difference between favored people, mostly in Europe and some European settlements at mid-latitudes (USA, Australia), and less favored people mostly in the tropics. It was speculated that this difference in living conditions and challenges would not only manifest in economy, and civilization – but also in bodily characteristics, such as the form of noses (Davies, 1932; Figure 5).

Thus, climate allowed the discrimination between “us” and the “others”, when seen with European eyes. The “others” were unable to develop reasonable levels of civilization, and would not be able to exploit the potentials of their lands and resources. Obviously, they were also unable to withstand the military power of the European powers, which was based on technological advancements.

Thus, climate was a major, if not the dominant cause for European “superiority” and the “others” inferiority, which was a property of the people, and their races, which had formed consistently in the different climates. The German social psychologist Willy Hellpach noted in 1938: “Prevalent in the north of a given hemisphere are the character traits of sobriety, harshness, restraint, imperturbability, readiness for exertion, patience, stamina, rigidity, and the resolute employment of reason and determination. The prevalent traits of the south are liveliness, excitability, impulsiveness, engagement with the spheres of feeling and imagination, a phlegmatic going-with-the-flow or momentary flare-ups.” (Quoted after Stehr and von Storch, 1999; Hellpach meant with the “north” mostly northern and central Europe, and with the “south”, but not only, the tropics).

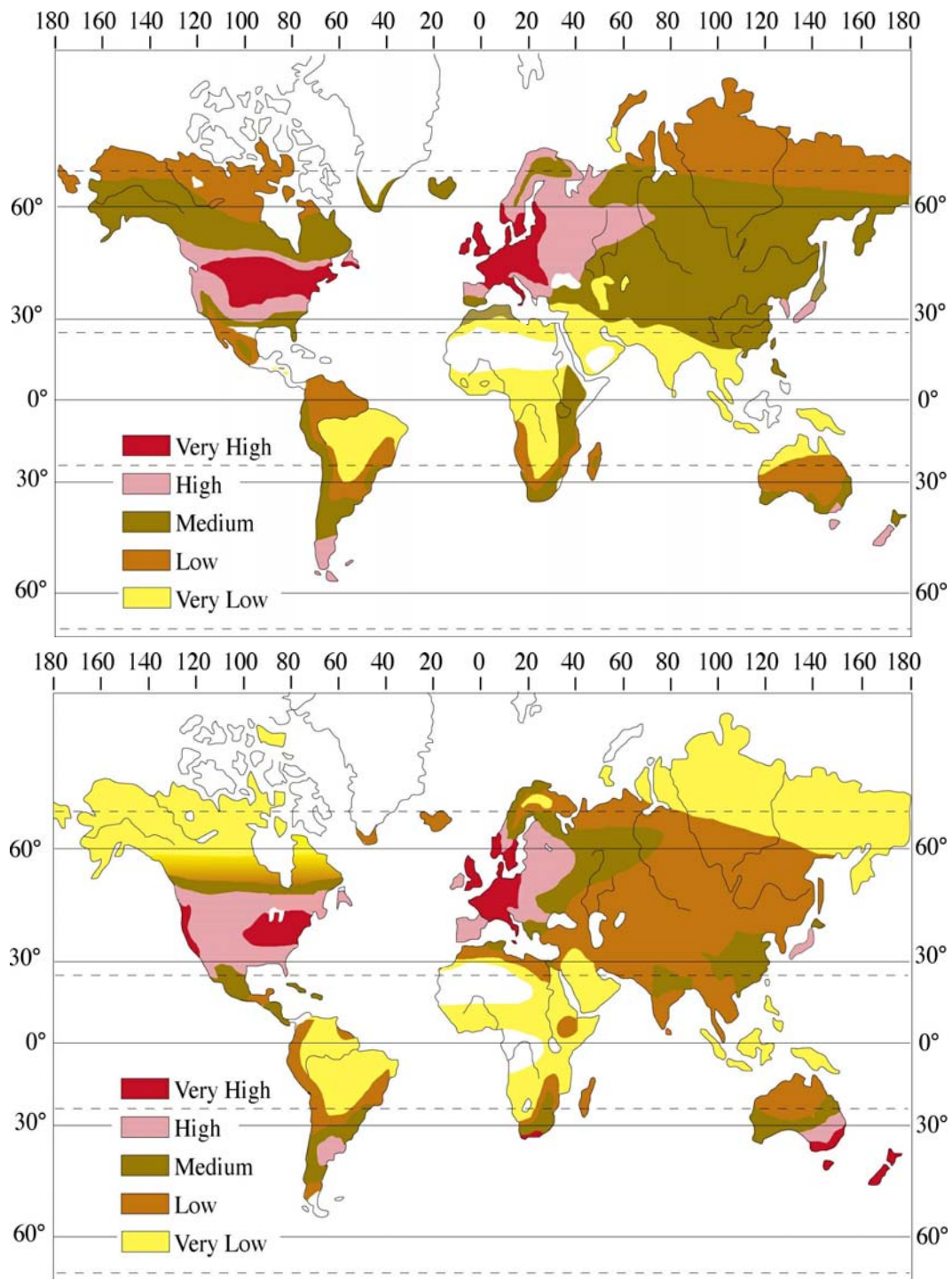


Figure 5: Two key diagrams in Huntington's analysis. Top: the global distribution of peoples' energy as derived from climatic conditions; bottom: global distribution of level of civilization as derived from a survey among international experts for the early part of the 20th century. (Reproduced from Stehr and von Storch, 2010)

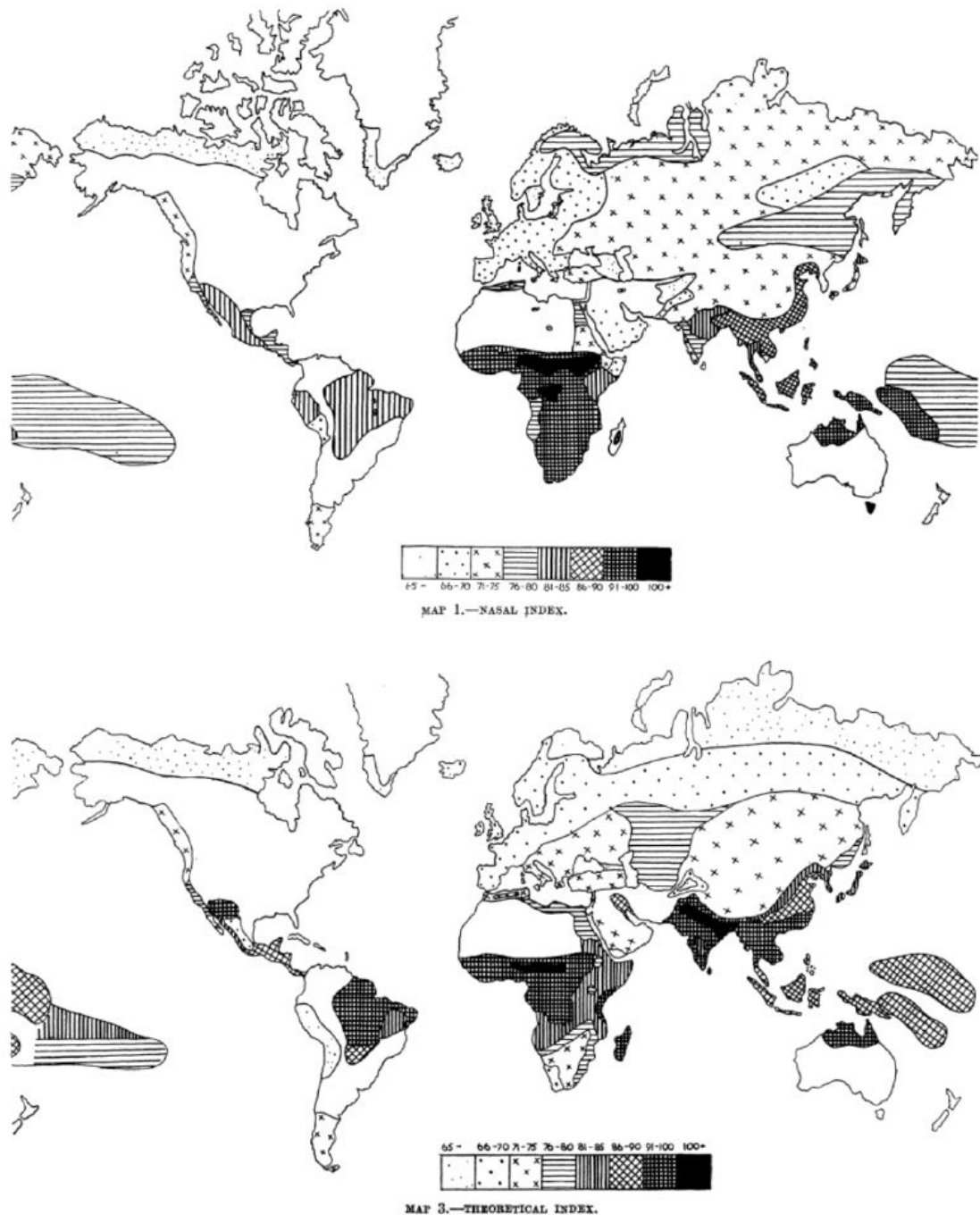


Figure 6: Davies (1932) comparison of “nose forms”, as observed (top) and as predicted from climatic conditions (bottom).

Such theories formed a basis for colonial activity, since the local population would be unable to develop efficient governance, economy and finer culture because of the natural barrier of adverse regional climates. This, we propose, may have led to two conclusions, namely that the advanced Europeans may use the resources of the “others”, as they were incapable of using them for themselves, and that the retarded “others” may need special support and treatment for mitigating the adverse effects of a non-inspiring and challenging climate. The former served as a legitimization for colonialism, whereas the other explanation

may have been a motivation for widespread evangelization, which often enough seem to have been a pre-form of colonization.

An intriguing detail of the alleged significance of the climate monitoring in the German colonies was the claim that its purported excellence would constitute counter-evidence against the Entente's argument for the forced loss of the German colonial empire, namely mistreatment of local populations. Such policies would not be inconsistent with the legitimate purpose of exploiting resources, which would otherwise be unused, but it would contradict an intention of "helping" the locals in mitigating the unfairness of climate. Along these lines, Paul Heidke wrote (1921, 143-148; translated from German) "It was claimed that Germany would be unworthy to own colonies, because of their inhuman treatment of aborigines and the lack of cultural investments into these countries. However, Germany has researched the geographical and climatological conditions of these countries" in a better way than, say, the French or the British, and thus achieved significant cultural progress contrary to the Entente's claims.

Discussion

The significant political role, which the science of climatology is playing today, is not unprecedented, as most climatologists unaware of the history of climate sciences may believe. As both a legitimization and a management tool, climate sciences were connected to the practice of colonialism and imperialism in the past 200 and maybe more years. Climate science has a rich history in providing legitimacy for significant political developments.

Another motive of the 19th century climatology is also coming back to current climatology, namely to attribute climate, now: climate change, significant roles in health, economy and well-being (Stehr & von Storch, 1997, 1999; Hulme, 2011).

Seemingly, historical comparative analysis may tell current climatologists and their political actors a lot about their role potentials and risks. The perception that "the west" "knows better" than the (still) "others" and dominates "the science" and thus any reasonable "science-based" policies", is still around. Examples are described by Barnett & Campell, (2015, p 72) for the South Pacific, or other cases, for instance on Bangladesh, are reported about in the media (<http://en.ntvbd.com/bangladesh/46333/PM-defends-Rampal-power-pla>).

Appendix

Qingdao: Digitalization of historical climate data from Chinese stations

The description of the project "*Digitalization of historical climate data from Chinese stations*" (DWD, 2008) reads:

"The data collection project "Digitalization of historical data from Chinese stations" was carried out at the German Meteorological Service, Deutscher Wetterdienst, in Hamburg on behalf of the GKSS Forschungszentrum Geesthacht GmbH in the period 01.05.2008 to 31.10.2008.

Deutscher Wetterdienst in Hamburg has an extensive archive of original weather records from the German colonial period. It includes data from the following three Chinese stations on the coast of the Yellow Sea: Tschingtau, Schatsykou, Tschalientau, and the railway

junction Tsinanfu West.

There are monthly, yearly and daily values (3 observations per day) of these stations of the period 1898 to 1914. A smaller subset was printed in the volumes of "Deutsche ueberseeische Meteorologische Beobachtungen" der Deutschen Seewarte. The daily values were digitized from the handwritten, original climate observation records.

Generally, the daily observations were done at 7am, 2pm and 9pm from July, 1st 1899 on, before at 8am, 2pm and 8pm.

The digitization project was carried out in following steps:

1. Digitization of all available data of the four stations published by Deutsche Seewarte.
2. Digitization of all daily values (3 messages per day) from original climate observation sheets.
3. Quality control (check for internal consistency of observations and extremes, comparison of digitized daily values with published monthly values, comparison of data by station), corrections, if necessary and appropriate.
4. Conversion of units (mm Hg → hPa)"

Station and Instruments in Qingdao

The station and instruments in Qingdao were described in Deutsche Seewarte (1904) - quoted from an internal document of Deutscher Wetterdienst:

"Period: 03/1898 - 12/1913

Position:

July 1898 to October 1899	36°4' N 120° 17'E, barometer height 14,9 m
October 1899 to 30.04.1905	36° 4' N 120° 17'E, barometer height 24,0 m
01.05.1905 to 01.09.1905	36° 4' N 120° 19'E, barometer height 50,0 m
After 01.09.1905	36° 4' N 120° 19'E, barometer height 78,64 m

Surrounding:

Tsingtau is situated on the northeastern edge of the entrance into Bay of Jiaozhou Bay. The hilly surroundings border in north-north-east to the mountains of Lauschan. The plot of the observatory is on a small hill, so the wind has free access from all sides. The mercury barometer hang in a small brick house. In front of the window of the house, showing northeastward, was the psychrometer. The extreme thermometers were located separately in a special thermometer hut as described in Mohn: Grundzüge der Meteorologie, 5th edition, page 24. The rain gauge was about in the middle of the square, free from influences of buildings. The wind vane was on the north side of the weather hut fixed on a mast, overtopping it by about 2 m.

Since 1 May 1905 the station is located north of the military hospital (see maps below). The mercury barometer is located in a small stone cottage sheltered against heat radiation. The thermometers are all in a Stevenson screen on the top of the observatory hill, 1.85m above the ground. The soil, mainly out of granite, under the thermometer hut is only sparsely covered with grass and weeds. The rain gauge is situated about 12 m east of the thermometer hut in a completely free position, the height of the catch area is 1.90 m above ground. The wind vane is fixed 2 m above the roof of the instrument hut.

Instruments:

Berkleyscher Anemograph

Sunshine autograph

Mercury barometer Type: R.Fuess No.1361 (corr. +0.1 mm)

Rain gauge type Fuess- Hellmann

Rain gauge type Deutsche Seewarte and Hellmann

Dry thermometer R.Fuess No. 18a (corr. -0.1°C)

Wet-bulb thermometer R.Fuess No. 18b (corr. – 0.1 °C)

Maximum thermometer No. 5392 (corr. +/- 0 °C)

Minimum thermometer No. 4792 (corr. – 0,1 °C)

Hours of observation:

Since July 1st, 1899; 7am, 2pm, 9pm

Before: 8am, 2pm, 8pm

Remarks:

The data of the maximum thermometer seem to be too high, because they were read in horizontal position.

Observers:

Until 31.12.1899 Kaiserliches Vermessungsdetachment, afterwards members of the meteorological- astronomical station”

Bibliography

Barnett, J., and J. Campbell, *Climate Change and Small Island States. Power, Knowledge and the South Pacific*. Earthscan, London, Washington DC, 218 pp, 2015.

Davies, A., A Re-Survey of the Morphology of the Nose in Relation to Climate., *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 62, 337-359, 1932

Deutsche Seewarte, Ergebnisse der meteorologischen Beobachtungen in Tsingtau: September 1898 bis August 1903, *Analnen der Hydrographie und Maritimen Meteorologie*, 32 198-203, 1904.

Deutscher Wetterdienst, *Digitalization of historical climate data from Chinese stations*. Internal document, 2008.

Eves, R., Unsettling settler colonialism: Debates over climate and colonization in New Guinea, 1875-1914. *Ethnic and Racial Studies* 28, 2, pp. 304-330, 2005.

Hammerl, C., Viennese school of climatology. *Oxford University Press Research Encyclopedia Climate Science*, in press, 2018

Heidke, P.: Das meteorologische Beobachtungsnetz in den deutschen Kolonien, *Meteorologische Zeitschrift*, 38, 101ff 1921

Hellmann, G., and H.H. Hildebrandsson, *Internationaler Meteorologischer Kodex*, Veröffentlichungen des Königlich Preußischen Meteorologischen Instituts Berlin: Behrends & Co. S. 54-57, 911, reprinted by Springer Verlag, <https://doi.org/10.1007/978-3-662-25534-6>

Hulme, M., Reducing the Future to Climate: A Story of Climate Determinism and Reductionism. *Osiris*, 26, 1, 245-266, 2011.

Huntington, E., *Mainsprings of Civilization*, John Wiley & Sons, New York, 1945.

Jaeger, F., Wesen und Aufgaben der kolonialen Geographie. *Zeitschrift der Gesellschaft für Erdkunde*, Berlin 1911, 400-405, 1911

Fei J (费杰), Meteorological history and historical climate of China. *Oxford University Press Research Encyclopedia Climate Science*, in press, 2018

Kortum, G., The naval observatory in Tsingtao (Qingdao), 1897-1914. German background and influence. In Gary Wright (ed.): *Ocean Sciences Bridging the Millennia: A Spectrum of Historical Accounts* 507 pp., Paris, UNESCO Publishing, 2004

李琰 (Li Y.), B. Tinz, H. von Storch, 王庆元 (Wang Q.Y.), and 周庆亮 (Zhou Q.L.), Construction of surface air temperature series of Qingdao in China for the period 1899 to 2014. *Earth System Science Data*, 10, 643-652 (<https://doi.org/10.5194/essd-10-643-2018>), 2018

Marner, J., Die klimatischen Bedingungen für die Siedlung der Nordeuropäer in den Tropen: Dargestellt am Beispiel von Deutsch-Ostafrika. *Archiv der Deutschen Seewarte und des Marineobservatoriums*, 60, 1. Hamburg: Hammerich und Lesser, 1940.

Mahony, M., and G. Endfield, Climate and colonialism. *WIREs Clim Change* e510. <https://doi.org/10.1002/wcc.510>, 2018

Martin, G.J., *Ellsworth Huntington. His Life and Thought*. The Shoe String Press Inc., Hamden, Connecticut 06154, USA. ISBN 0-208-01347-4, 315pp, 1973.

Meyer, H. (Ed): *Das Deutsche Kolonialreich: Eine Länderkunde der deutschen Schutzgebiete. Zweiter Band: Togo, Südwestafrika, Schutzgebiete in der Südsee und Kiautschougebiet*. Bibliographisches Institut, Leipzig – Wien, 1910

Mohr, F.W. (Ed): *Handbuch für das Schutzgebiet Kiautschou*. Tsingtau: Walther Schmidt 1911.

Mühlhahn, K., Qingdao (Tsingtau) - Ein Zentrum deutscher Kultur in China?, in: Martin Hinz/Christoph Lind (Eds) Tsingtau. *Ein Kapitel deutscher Kolonialgeschichte in China, 1897-1914*, Berlin: Deutsches Historisches Museum, S. 121 – 132, 1998.

Pyenson, L., Cultural Imperialism and Exact Sciences, *Studies in History and Culture*, Peter Lang Publishing, 342 pp, 1985

Shen B (沈冰冰), Zhang J(张静), Yan H. (颜惠玲), and Zhang M(张敏), 青岛观象台的历史沿革与贡献研究 (1898—1949年). (Qingdao Observatory's Historical Development and Contribution (1898-1949)). *Advances in Meteorological Science and Technology 气象科技进展* 6,4, 2016

Stehr, N. and H. von Storch: Rückkehr des Klimadeterminismus? *Merkur* 51, 560-562, 1997

Stehr, N., and H. von Storch, An anatomy of climate determinism. In: H. Kaupen-Haas (Ed.): *Wissenschaftlicher Rassismus - Analysen einer Kontinuität in den Human- und Naturwissenschaften*. Campus-Verlag Frankfurt a.M. - New York (1999), 137-185, ISBN 3-593-36228-7, 1999

Stehr, N. and H. von Storch, Von der Macht des Klimas. Ist der Klimadeterminismus nur noch Ideengeschichte oder relevanter Faktor gegenwärtiger Klimapolitik? *Gaia* 9, 187-195, 2000.

Stehr, N. and H. von Storch, *Climate and Society. Climate as a Resource, Climate as a Risk*. World Scientific, 2010

von Storch, H., M. Clausen, and C. Gräbel, Zur Geschichte der Klimaforschung in Hamburg. Collection of papers on the 100-year anniversary of the University of Hamburg; in press, 2019