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In Search for Hope: Human-Mosquito Relations as a Model for Global Environmental Cooperation (A Research Note)

Dan Tamïr
University of Zurich, Zurich, Switzerland
dan.tamir@uzh.ch
ORCID: 0000-0003-3988-4280

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by Dan Tamïr

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Abstract

The current condition of our planet is alarming, as the Earth is experiencing both global warming and a mass extinction of species: two human induced phenomena devastating our environment. The reason for these crises is neither lack of knowledge about their source, nor the absence of the technical means to deal with them: what we lack is the capacity to act jointly, through global political mechanisms allowing a coordinated effort to change our behavior. While such mechanisms may be difficult to imagine, this research note suggests that a precedent for such a coordinated global environmental action may be found in the worldwide campaigns against mosquito borne diseases (MBD) which were carried out during the twentieth century. Pointing at some similarities and several dissimilarities between the combats against MBDs and a possible global effort which may be initiated nowadays, this research note calls for drawing lessons from the past dealing with MBDs for learning how to cope with our current global environmental challenges.

Keywords: MBD, mosquitoes, climate change, international cooperation, historical precedent, global warming

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About the Author

Dan Tamïr is an environmental historian and research associate at the University of Zurich. His research examines the global circulation and the local adaptations of ideologies, species, and resources. His current research focuses on the global political cooperation in targeting mosquito-borne diseases during the past century.

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Looking for A Hopeful Precedent

The current condition of our planet is alarming, as the Earth is becoming warmer, and more animal and plant species are going extinct with every passing year. During the past year, concentrations of the major greenhouse gases (CO_2, CH_4, and NO_2) continued to increase despite the temporary reduction in emissions in 2020, which is related to events stemming from the COVID-19 pandemic. The past six years have been the six warmest years ever recorded. The trend in sea-level rise is accelerating while ocean heat storage and acidification are increasing, thereby diminishing the ocean's capacity to moderate climate change. The Arctic minimum sea-ice extent in September 2020 was the second lowest on record, while Antarctica is losing approximately 175 to 225 gigatons of ice per year. Hurricanes, extreme heatwaves, severe droughts, and wildfires in the past year led to tens of billions of US dollars in economic losses, let alone many human deaths. During the first half of 2020, there were some 9.8 million global displacements, largely due to hydrometeorological hazards and disasters (WMO 2021).

The crisis we are in and the problems we are facing are not "natural" in the sense of being detached from human action, nor are they entirely "environmental," i.e. altering only the physical sphere that we inhabit. The latest Human Development Report of the UNDP phrased it in mild words when it claimed that "the challenges of planetary and societal imbalance are intertwined" since they interact "in a vicious circle, each making the other worse." The serious, immediate and existential risks that we are facing are all human-made (UNDP 2020).

One of the basic features of a classical Greek tragedy is the hero's progression towards his bitter end, a progression driven by the hero's inability or unwillingness (or a combination of both) to stop, re-think, and change his behavior, in spite of receiving

hints and signs warning him about the danger he is getting himself into. Often, when the hero realizes the depth of the trouble—it is all too late to change the situation he is in, as he is led by his fate. Are we witnessing a Greek tragedy unfolding before our eyes, in which we are both silent spectators and playing the role of the hero? Sadly, the answer seems to be positive: we have clear and alarming scientific data (Japan Meteorological Agengy 2020), and just as clear are the anticipated outcomes of the Earth's current warming process (Toleffson 2016). Adding to this tragedy is the fact that there is abundant technological knowledge available to help us away from emitting so many dangerous greenhouse gases (Delucchi and Jacobson 2011a/b). Similarly, we know what must be done to conserve endangered species. But even if we see local initiatives and regional collaborations with much potential to mitigate climate change and biodiversity loss, we seem to be walking with our eyes wide open toward a tragic global destiny.

Why is that? We do not lack knowledge about these realities, nor the means to change them. It seems that what we lack is the capacity to act jointly by way of mechanisms allowing a globally coordinated political effort to change common behavior. Decisive global action is urgently needed to reduce emissions and save biological diversity, but we can hardly imagine such comprehensive action. Having a precedent for such a huge effort should be useful for planning our near future – but where can we find such a precedent? My argument is that such a precedent may be found in how humans dealt with mosquito-borne diseases (MBDs) during the twentieth century. This precedent is not perfect, as dilemmas of such scope are never identical in their exact features. Understanding mosquito control could, however, provide much needed lessons regarding global political mobilization and coordination. The following paragraphs offer brief accounts of similarities and dissimilarities between twentieth-century global anti-MBD actions (GAMBDAs) and possible twenty-first-century global climate actions (GCAs), as well as some concluding thoughts about extrapolating from the history of GAMBDAs regarding our current situation.

Why Mosquitoes?

Mosquitoes are one of the most dangerous animals for humans: the diseases transmitted by certain species of mosquitoes levy an enormous death toll. While estimates regarding the exact number of individuals who succumb to MBDs annually vary from around 550,000 to 700,000, there is little dispute regarding their lethal effects (Kristof and Ma 2018). The most widespread mosquito-borne diseases are malaria, yellow fever, dengue, West Nile Virus, and chikungunya, followed by Zika and several other

pathogens. Although global mortality rates have been falling during the past decade, these diseases are still responsible for frighteningly large rates of morbidity. In 2015 alone, there were an estimated 212 million cases of malaria globally, causing more than 420,000 deaths, 300,000 of which were African children under the age of five. Conservative estimates show that around 900 children die every day because of malaria transmitted by Anopheles mosquitoes (WHO 2019).

Beginning in the early twentieth century, coping with mosquitoes and the pathogens that they carry became an international endeavor, involving many different—sometimes even competing-players. Although MBDs continue to be present and lethal today (mainly in Sub-Saharan Africa), the world saw many successes in keeping them at bay and even eradicating them from entire countries through a series of campaigns. Driven in part by national and ideological interests, campaigns against mosquitoes and the diseases that they transmit also featured deep co-operation between scientists from different countries, states, agencies, non-governmental organizations, private foundations, and entrepreneurs. This is therefore a useful model for coordinated worldwide action for coping with a dire global threat along the lines of the challenges of confronting climate change.

Dissimilarities

One clear dissimilarity between GAMBDAs and GCAs is the urgency of the matter. Climate change, on the one hand, is quite literally a burning issue. Although Earth experienced repeated warming and cooling in the geologic past, our current global warming has no known precedent. It is human-made, abrupt, and very real (Waters et al. 2016), presenting a clear emergency (Ripple et al. 2020). Mosquito-borne diseases, on the other hand, have been integral to the development of human societies: geographically, prompting humans to migrate; genetically, selecting for individuals and lineages with hereditary immunity. While these insects may kill individuals, debilitate communities, and menace entire regions, they do not pose a threat to the existence of entire civilizations (Packard 2007; Webb 2011), as does humanity's addiction to fossil fuels.

A second dissimilarity between GAMBDAs and GCAs is their scope. MBDs are spread throughout the world, and responsible for hundreds of thousands of deaths annually (Hall and Tamïr 2022). However, they are limited to the pathogen-vector-human sphere of immediate contact. Climate change, by contrast, results from many different aspects of modern life. It would be a mistake to see global warming only as the outcome of greenhouse gas emissions: since entire civilizations are based on cheap fuel and products derived from fossil fuels, it is advanced economies in the Global North

that are responsible for this problem, with the prevailing political order of the world (Hornborg 2019; Princen et al. 2015).

Similarities

The basic similarity between GAMBDAs and GCAs is the science-technology-politics nexus mentioned earlier. While relationships between the three components are complex, the concrete and immediate organizational challenges in the case of both dilemmas may be described as a simple "shopping list," i.e. the necessary knowledge and techniques are present, but there is a lack of political capacity to implement them. Indeed, efforts to combat climate change and mosquito-borne disease have followed a similar path: (1) reaching a common understanding of the problem; (2) identifying technical solutions and setting goals; (3) establishing political mechanisms for implementation; (4) maintaining momentum.

In terms of connections between the politics and the science of human interactions with mosquitoes across the twentieth century, we can see a line leading from (1) scientific discoveries about the causes of diseases through (2) the development of technical solutions to (3) implementation by governments. This began with the discoveries of Carlos Finley and Walter Reed regarding the transmission of yellow fever by *Aedes* mosquitoes, followed by the work of Ronald Ross and Giovanni Batista Grassi on connections between *Anopheles* mosquitoes and malaria in the 1890s. The process continued through technical means for combating these two types of mosquitoes, from the mechanical (screens and bed nets) via the chemical (Paris green, oil, and DDT) to the biological (*Bacillus thuringiensis*). All these control methods required political coordination through governments, private foundations, and international organizations.

A second feature that is common to climatic problems and mosquito-borne diseases is the tension between competing proposals for mitigation: one proposal may aim to eliminate the problem altogether (or at least neutralize it), whereas another proposal may try to cope with the problem at a larger scale, often by developing ways of "learning to live with it." In the case of mosquitoes, this tension became manifest in the long debate between proponents of eradication and proponents of control, i.e. those aiming for total extermination of either pathogens or their vectors, versus those searching for methods that would allow humans to live side-by-side with mosquitoes and the diseases that they carry, even accommodating low levels of morbidity (Leys Stepan 2011). Similarly, public attitudes toward climate change cover both extremes: one calling for drastic and fundamental changes in energy consumption, the other declaring the situation too far gone, which leaves adaptation to a much warmer planet

as the only course of action.

Concluding Thoughts

An encouraging feature of activities against MBDs is their political development from nationally centered and occasionally competitive approaches to a globally coordinated movement. Anti-mosquito measures did not begin as an orchestrated international endeavor: the first scientific investigations into MBDs at the end of the nineteenth century were carried out by physicians and scientists working largely for military occupying forces and colonial rulers. Such was the case with Reed's discovery of the yellow fever pathogen as part of the US military occupation of Cuba, and Ross's investigations of plasmodium's links with malaria, carried out under the British colonial regime in India. Moreover, the scientific rivalry between the British (Ross) and the Italians (Grassi) over the discovery of the role of the mosquito in transmitting malaria was deeply nationalistic. Only after the First World War and the establishment of the League of Nations did significant scientific and political cooperation evolve.

The establishment of a worldwide network was gradual, beginning with the League of Nations Health Organization (LNHO) orchestrating efforts to fight mosquito-borne diseases on a global scale. Although early international cooperation was basic (as with other aspects of the League's activity), the LNHO—in parallel with the Rockefeller Foundation's International Health Division—laid the groundwork for the World Health Organization's campaigns after the Second World War (Birn 2009; Farley 2004). The Rockefeller Foundation's widespread activities set a precedent for involving a range of NGOs in global campaigns. International cooperation against mosquitoes even continued through the Cold War: efforts led by the United Nations from 1955 to 1970 did succeed in combating malaria in many parts of the world, though mosquito-borne diseases still remain far from being eradicated today.

In all this, there is a recurring question about the place of politics: if humans are primarily "political creatures," can any action in the public sphere be separated from a political meaning/context? To the extent that politics connects distant environmental challenges, it seems necessary to dwell on how a sense of patterns of successes and failures in past cooperations may help to bring about better methods, as well as to prevent difficulties when confronting common contemporary dilemmas.

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